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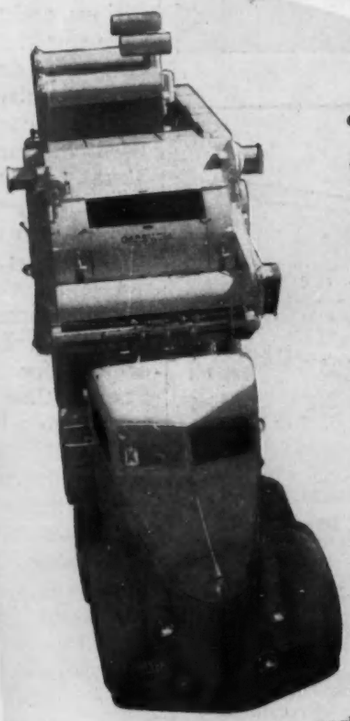

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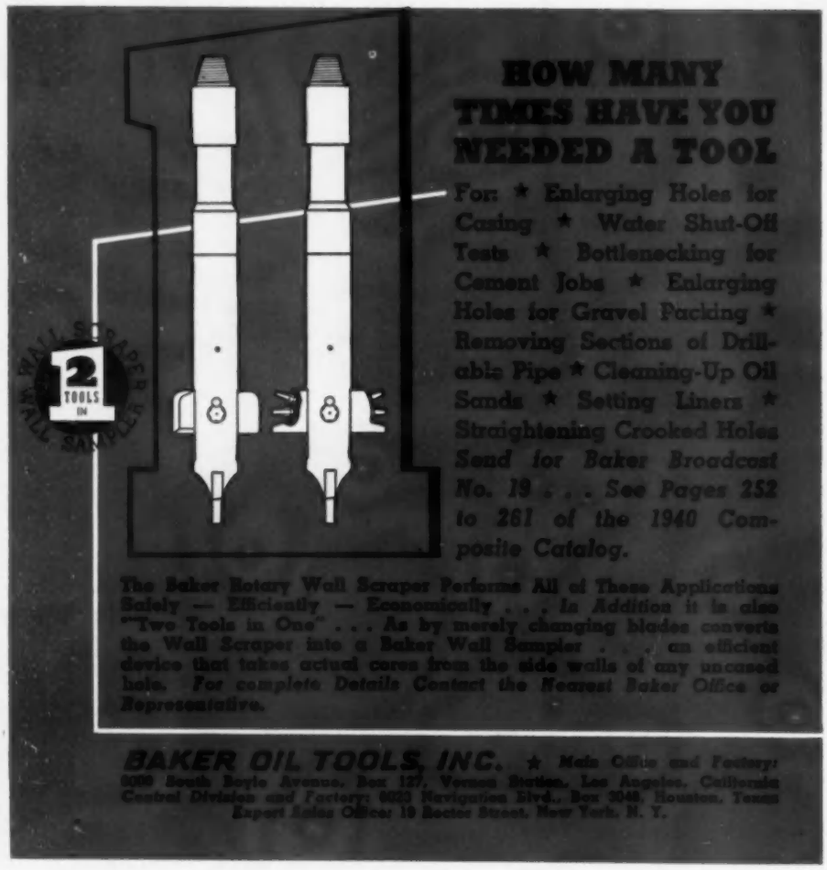
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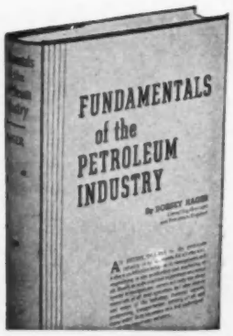


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# Looking Ahead

WITH THE EDITOR

SMALL FLOW STRINGS have been adopted in several producing districts. This trend toward smaller flow strings has been most pronounced where low well allowables prevail, small initial production is expected, deeper drilling is unlikely, or the chance for outright failure is prominent. Contributing factors are chiefly economic, since larger oil strings admittedly are more satisfactory from a mechanical viewpoint. Smaller tubing strings are being used as a direct result of the new casing programs, and many engineers contend that this will prolong the flowing life of the wells.

Operators are not in agreement as to the smallest size of casing that should be run under given conditions, and three or four different-diameter strings may be used in a single district. On the whole, the most popular size seems to be the 5½-inch casing, which is much used in such regions as West Texas, New Mexico, the Gulf Coast, and, to a lesser degree in Kansas, North Texas, East Texas and North Louisiana.

Use of smaller oil strings has influenced other phases of drilling operations. For instance, the hole drilled for 5½-inch casing is smaller than that drilled several years ago when larger oil strings completely dominated the field. Sometimes an 8⅝-inch hole is drilled below the surface string, which ordinarily is 10-inch or 10¾-inch casing.

An article, to be published in an early issue, is to discuss this trend toward use of smaller flow strings, an important development in view of the industry's search for operating economies.

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# THE OIL WEEKLY

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## The Oil Man's Calendar

| | |
|---|---|
| DEC. 5- 6 | Mid-Continent Oil & Gas Association, Annual Joint Meeting of Standing Committee on State and Local Taxation, and Standing Committee on Federal Income and Excise Taxation, Tulsa. |
| 6 | American Petroleum Institute, Illinois Basin Chanter, Salem. |
| 12-13 | Petroleum Electric Power Association, Baton Rouge. |
| 16 | Mid-Continent Oil & Gas Association, Annual Meeting of General Board of Directors, Tulsa Club Roof, Tulsa, Okla. |
| 1941 FEB. 22 | North Texas Oil & Gas Association, Wichita Falls. |
| 27-28 | American Petroleum Institute, Division of Production, Southwestern District, Shreveport. |
| MAR. 11 | American Petroleum Institute, Division of Production, Spring Meeting, Pacific Coast District, Los Angeles. |
| APRIL 2- 4 | American Association of Petroleum Geologists, Twenty-sixth Annual Meeting, Houston. |
| 17-18 | American Petroleum Institute, Division of Production, Eastern District, Pittsburgh. |
| 23-25 | Petroleum Industry Electrical Association, Tulsa. |
| 23-25 | Natural Gasoline Association of America, Dallas. |

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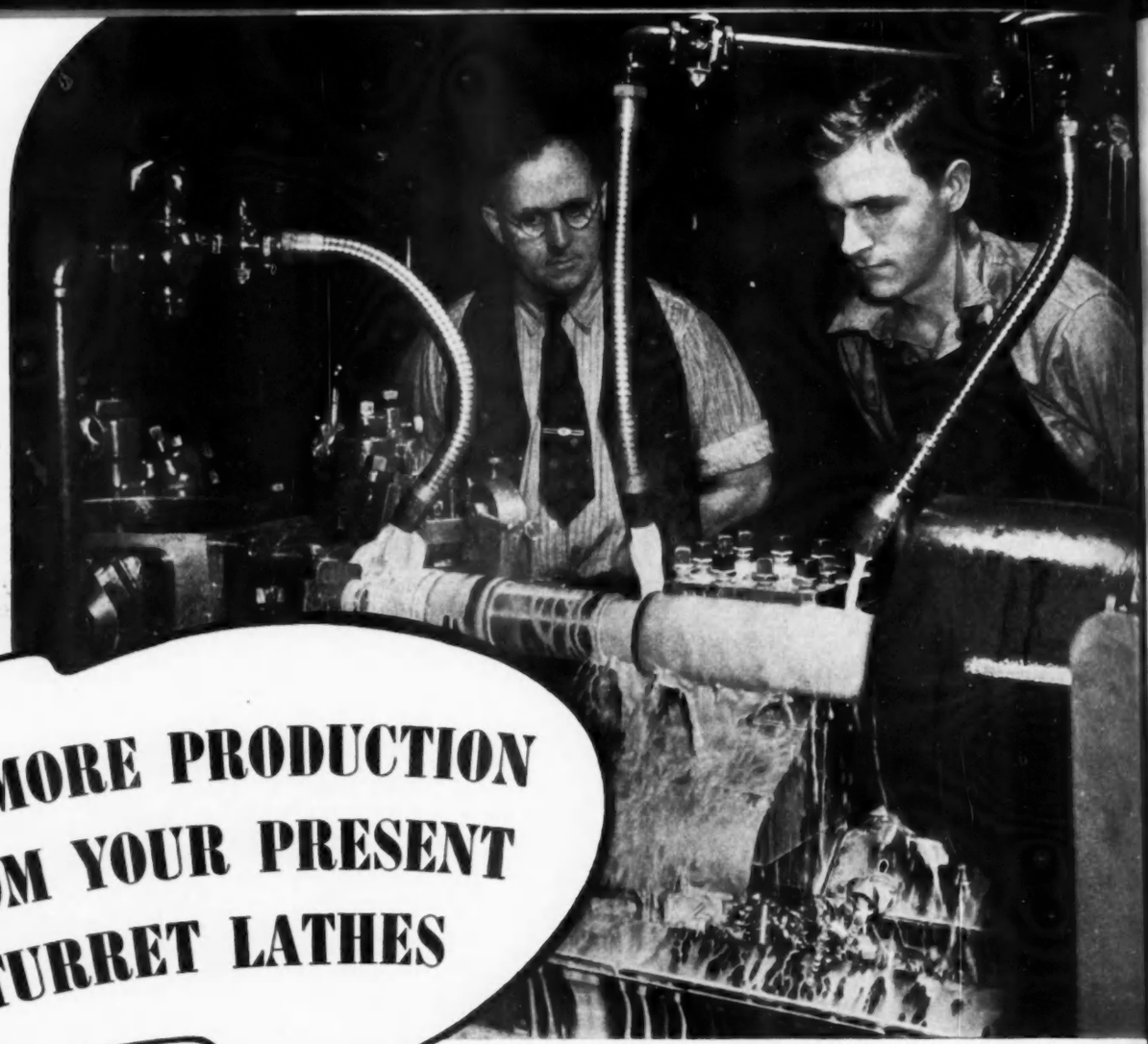

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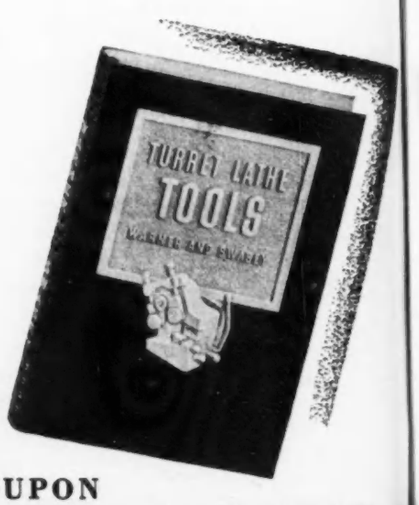


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# The Changing Panorama

### *Sore Spots . . .*

Situations in two states at this time are having a bearing on the possibility of federal control—the situation in Texas and that in Illinois. Texas, a member of the Interstate Oil Compact Commission, created to give an opportunity for state, instead of federal control in the oil industry, is going through an experience which is causing many who have opposed federal control to feel that such control is inevitable unless the situation is changed. Some time ago, Ernest O. Thompson, of the Texas Railroad Commission, issued a statement in which he laid the cause of special allowables in that state at the door of the Texas proration law, which he said gives the commission power to fix allowables only on the basis of preventing physical waste and market demand for oil from the various fields. A United States Supreme Court decision, which came after his speech, however, appears to give the Texas commission powers beyond those which the commissioners only recently claimed as their sole basis of action.

### *Appointive Texas Body? . . .*

One hears of a great deal of talk on the matter of an appointive railroad commission in Texas. The present commission is elective, and the recent state election saw two of the commissioners actively seeking the Democratic gubernatorial nomination (tantamount to election in Texas), and it is a rare election which does not find some commissioner using the commission as a springboard to a higher office. This is contrary to the situation on other commissions in the state where commissioners are appointed by the governor and confirmed by the senate. Proponents of an appointive railroad commission say that the commission is so continually in politics that members find it very difficult to keep from seeing oil matters excepting through spectacles which reflect the political effect of an action. Political friendships, they say, are forgotten with the greatest of difficulty in the commission's activities.

Not only are oil people talking along this line, but other groups have begun talking. The Texas Manufacturers Association recently passed a resolution endorsing an appointive commission, and recommending the divorcement of railroad affairs from oil conservation on the ground that the commission has been neglecting its railroad work.

The feeling apparently is growing and with the federal situation threatening, as many think it is, recent action of the Texas Railroad Commission in granting special allowables is adding fuel to the flames.

### *Illinois Administration Change . . .*

Illinois is a member of the compact but without the necessary laws to make its membership effective. Governor-elect Green, a Republican, is succeeding an administration which was not particularly friendly to conservation laws in Illinois. It is thought that a conservation law will be proposed during the coming year, and that the chance of Illinois actively cooperating with the Interstate Oil Compact is good.

### *Brazil Refinery Rumor . . .*

Under the head of rumor comes the report that the proposed partial financing of a refinery in Brazil by United States government money has hit a snag. The report indicated that the United States government, through one of its lending agencies, was planning to furnish part of the capital for a refinery near Rio, the remainder to be raised from private and Brazilian government sources. Rumor also had it that the oil to be processed would be bought from the Mexican government, expropriated oil belonging to American and British companies. Whether or not news of the proposed source of crude oil leaked out and the proposition met with disapproval on the part of the British, or whether the Brazilian funds failed to materialize, remain in the realm of speculation. One thing which does seem certain is that no objection on the part of the American interests, whose expropriated oil would be used, would avail.

### *Industry Is Ready . . .*

The speech of Dr. Robert E. Wilson, petroleum adviser to the council of national defense, before the American Petroleum Institute's open session on Wednesday of last week, reiterated the things he said before the Independent Petroleum Association of America's annual meeting in Dallas a few weeks ago. He repeated that the producing branch is in splendid shape to increase its production; indicated that the refining branch, though not in position to increase its runs by the percentage possible in the producing branch, was amply able to take care of the needs facing it; pointed out that even on aviation gasoline, a possible bottleneck in the future, present capacity is far in excess of present needs.

Specifically, he said: "To date, the total buying of petroleum resulting from the defense program has been negligible — much less than enough to offset the loss of our exports to the continent of Europe. However, this demand is on its way. Not only will the Army and Navy have steadily increasing demands for almost every petroleum product, but there will also be additional industrial demands and demands from men who will have employment for the first time in many years. I estimate that by this coming spring these increasing demands will, on the whole, offset our loss of exports, and thereafter will increase steadily to a figure substantially beyond any total requirements the industry has yet seen."

His speech, and that of T. H. Barton, president of Lion Oil & Refining Company, said plainly: "The oil industry is ready." And Dr. Wilson, as well as Barton, concluded his speech with a plea for unity.

The API, like other oil organizations, has been careful to go to every possible limit to tell the government that it is willing in every way to aid in national defense.

It will be rather difficult for anyone to make out against the oil industry a case based upon charges that the industry is in a poor state of preparedness and that it shows unwillingness to cooperate.

# Industry Pledged to National

## Conservation Practices Praised by Defense Official; Continuation of Compact Asked

NATIONAL defense was the theme of the twenty-first annual meeting of the American Petroleum Institute, held November 11-15 in Chicago. The two general sessions Wednesday and Thursday brought five addresses, each studded with expressions pledging the industry to play its part in the rearmament program.

A resolution by the board of directors Thursday pledged the Institute to whole-hearted support of the program. Another resolution asked for continuation of legislation under which the Interstate Oil Compact Commission exists.

All officials were re-elected. Two changes were made in the executive committee, H. D. Collier, Standard Oil Company of California, succeeding the late W. H. Berg, of the same company, and Reese Taylor, Union Oil Company, succeeding L. B. Simmons, Rock Island Refining Company.

San Francisco was selected for the next annual meeting, and the mid-year meeting will be held in Tulsa.

Speakers at the first general session Wednesday were William R. Boyd, Jr., executive vice president of the Institute; T. H. Barton, Lion Oil Refining Company, and Dr. Robert E. Wilson, petroleum section, raw materials division, Advisory Commission to the Council of National Defense. The second general session was addressed by H. W. Prentis, Jr., president of the National Association of Manufacturers; William J. Cameron, Ford Motor Company, and Martin Dies, congressman from Texas and chairman of the committee on un-American activities.

### Wilson Commends Conservation

Meetings of both the divisions of production and refining Friday morning completed the program.

Wilson gave proration and conservation credit for providing a sufficient amount of crude oil reserves, although he advised that a normal rate of drilling be continued to assure discoveries. Concerning production, he said:

"Thanks to proration, the producing branch of the petroleum industry is particularly well prepared for any emergency. During the last war, the price of crude had to be increased very substantially in order to encourage more wildcatting and the drilling of many new wells. Although such a prospect might, at first blush, appear alluring to the producer in view of the present state of the market, if there is one thing we have learned, both from the last war and from the hectic twenties, it is that marching up that hill involves a painful slide back down the other side. Some of you may remember the vivid description of the slide by Dave Moffitt at the 1921 meeting of the American Petroleum Institute. To my mind one of the most constructive features of the defense commission program is its definite policy of endeavoring to prevent the vicious spiral of "higher prices for everything" from getting started.

"Today those states which have practiced sound conservation principles have built up tremendous underground reserves, available at a moment's notice for practically any emergency and this without putting an extra load on the steel industry or the labor market to drill thousands of new wells. You may well guess that anyone locating new refineries or industries based on petroleum would naturally favor such states over those which have squandered their assets and have only a declining production to look forward to.

"Of course, the industry must not relax its normal activity toward making new discoveries, although it should avoid unnecessary drilling and unsound spacing programs which use up capital, labor and steel to no useful purpose. New wells and fields must be discovered and connected up and new pipe lines built as old fields play out. In spite of alarmist reports in various quarters, our industry is still a long way from becoming a static one, coasting along to ultimate depletion."

Most of his remarks on motor fuel were devoted to 100-octane aviation gasoline, about which he said:

"Fortunately for the defense program, the petroleum industry, with its genius for overbuilding has already installed synthetic capacity beyond the present domestic and foreign demands, so there is today excess capacity available for the building up of a reserve for possible war demand. The installed capacity is, however, barely enough to meet our probable peace-time requirements, including exports, once our advanced training program is well under way, and is substantially less than enough to meet present estimates of full wartime demand after our plane-building program is complete. Revised specifications have just been issued which should increase the quantity available without any adverse effect on performance.

### Advises Building Stocks

The importance of building a stock pile now, while we do have some surplus capacity, seems obvious and a substantial start in this direction has recently been made by the army and navy. Even with such a stock pile, it would seem desirable from the defense viewpoint to have some additional capacity available within about 18 months, and I am hopeful that the industry will undertake such construction without government aid if we are able to arrange to give such plants the benefit of the 5-year tax amortization provisions. I hesitate to urge the industry to accumulate further stocks before the government really begins more substantial purchases but the prospective demand is such that I would not be doing my duty by either the government or by the industry if I did not urge that all existing plants be operated and no more synthetic product be diverted to motor fuel. Additional synthetic capacity could also make it possible to further improve the octane of the gasoline used by the military

# Defense at A. P. I. Meeting

## Industry Declared Ready to Meet All Demands; Technological Gains Cited; Officers Renamed

service, or it could be used to increase the quantity of 91-octane available for training purposes."

The combination of roads and service stations, because of putting military units under automotive power, drew this comment:

"If land defense of this country should ever become necessary this equipment, using our unequal system of highways and our widespread and efficient gasoline distributing system will give this country a flexible defense system better than several Maginot lines."

Wilson recommended only a limited expansion of storage facilities, thus outlined:

"In order to be prepared to meet emergency demands at uncertain locations and to protect its customers from possible interruptions of transportation, it appears that the industry in general should increase its storage facilities, particularly along the eastern seaboard, and should count on carrying somewhat larger stocks than would otherwise be considered adequate.

"The adequate protection of such storage facilities from possible bombing attack is a matter that has given concern to both federal and state agencies. At our request, the American Petroleum Institute has appointed a number of regional committees to study this question and to confer with the Army and Navy representatives in the various areas, both from the standpoint of protecting the industry's supplies and of protecting congested areas or harbors from the results of possible attack."

### Barton on Oil and Defense

T. H. Barton used the title "Oil and Defense," and reviewed the spirit and efforts of the petroleum industry to serve the public in peacetime, which he translated as evidence that the industry is prepared to do its share in defense, saying:

"My answer is that the petroleum industry is in the best position of any basic industry to serve her country in defense.

"The petroleum industry is geared in every way to meet today's and future emergencies in the spirit which characterizes it, in the conditioning to which its previous activities have subjected its members, in the position it holds in the national economic structure, in its technological advancements, in its productive facilities, in its reserves."

### Boyd Outlines Purposes

Boyd presented purposes, objectives and accomplishments of the institute as a trade association. Concerning the institute and its methods, he said:

"Believe me when I say to you, without equivocation or mental reservation that the American Petroleum Institute has not and is not now engaged in conducting any illegal or collusive activity. Nor do we believe that by any stretch of fact it can be proved by competent testimony in any court of justice that the institute has ever so engaged. I believe the institute is observing scrupulously all legal restrictions."

Contributions of the Institute to technological improvement within the industry were set out as evidence of accomplishment. Likewise, he singled out instances of cooperation between the institute and agencies of the federal government. He spoke of the committees which will assist in providing protection for stored gasoline and said that much of the organization's activity is carried out through its divisions and committees. Again he stressed the fact that these committees adhere to rigid programs, saying:

"Let it be said, truly, that the large number of committees of the Division of Production do not discuss nor deal with quantities of crude oil produced or stored or the price asked or paid therefor. Likewise, let it be said, truly, that committees of the Division of Refining do not discuss nor deal with quantities of products refined or stored or the price asked or received therefor."

In his remarks under the title, "The Citadels of National Defense," Prentis outlined the attitude of industry, and made a plea for an attitude from government which will permit business to have its share in the program. He summed up the attitude of business with:

"Industry is opposed to war not only on humanitarian but on economic and patriotic grounds, as well. It thrives on the arts of peace. In very truth it would beat 'Swords into plowshares and spears into pruning hooks' because it knows that all war is waste. Only through the production of more peace-time goods and services can the returns of industry be increased, and the fundamental objectives of industry be attained—the elevation of standard of living of all our people to higher and higher levels.

### Asks Head for Commission

"But with madmen running amuck in the world, American industry knows also the vital part it must quickly play if the tidal waves of war now overwhelming Europe and Asia are to be kept from the peaceful shores of the Western Hemisphere. Twentieth century war is not primarily warfare between men. It is the combat of iron men—warfare of machines and mass production. The Germans, it is reliably reported, conquered all of Western Europe with only 300,000 soldiers actively engaged, of whom but 40,000 were killed. Machines, not soldiers, create and support the modern prototypes of those ancient scourges of God—Genghis Kahn, Alaric and Attila. Fortunately for us now, it was the genius of free enterprise that created mass production and the same genius of American free enterprise that created mass production, and the same genius that invented it can and will excel in its use in the production of defense armament—given a fair chance."

Prentis singled out the conditions under which the National Defense Advisory Commission must

function, since none of its members is its executive head. He recommended immediate selection of an executive head for this commission.

"So far as industry is concerned," he added, "what more can it do? It has cheerfully pledged and given its support to government. It has taken a definite stand against profiteering. It has supplied its best administrators. Despite the mouthings of demagogues, American industry could not be drafted. It had already volunteered.

"Today, with the defense emergency upon us, industry asks from government a fair deal instead of the shabby deal of recent years; faith instead of suspicion; active governmental sympathy and support instead of demagogic criticism; statesmanship instead of politics."

Next he urged business men to take stock of themselves, saying:

"Let us examine ourselves for a moment. Take our attitude as American citizens. How many of us have ever made a really serious effort to study and understand the philosophic and religious principles on which our system of government, of economies and of civil and religious liberties, is based? How many of you have ever read Thomas Hobbes' 'Leviathan,' John Locke's 'Essays on Government,' Montesquieu's 'Spirit of Law,' Milton's great essays on freedom of speech and freedom of the press, the Federalist Papers? Be honest now. How many of you have ever devoted even one full day of your time to governmental problems? How many of you have ever interested yourselves directly in politics—the devising of policies, the selection and election of good men to represent you in public affairs? How many of you, if called upon to mount a platform with Earl Browder, Norman Thomas or Henry Wallace, right now could offer even a sketchy explanation and defense of the principles on which the American republic is based?"

After listing both the men and means by which state socialism is being fostered by giving the impression that government can provide for individuals, Prentis mentioned a quotation from Owen Wister, which asked Theodore Roosevelt and Henry Cabot Lodge how long they expected the government at Washington to last, and got an answer of 50 years.

Prentis observed: "Forty-five of those fateful 50 years have elapsed. What do the next five hold? The answer will be found in how many real patriots are left among us; how many men who are willing, not only to give their lives if need be, but who will labor unceasingly and unselfishly with mind and heart and tongue to preserve our precious American heritage of freedom."

### Cameron Blames Businessmen

Cameron placed the plight of business on businessmen themselves. His estimate of the situation is that men in business have learned too little from business.

"We were a pushover," he said, "when men began to blame business for its lack of contribution to American life. We did not know enough about what business has done and can do to counteract the appeal of the program the political reformers offered."

His remarks about the recent national election drew several rounds of laughter and applause. On the result of the election he said:

"But America got back her voice. Now we have a loyal opposition."

"You must remember," Cameron added, "that principles built on truth will be established. Whatever business has that is sound will prevail, and it will prevail without the benefit of any edict.

"Our job is to go on building the American economy, which has not been built. In this there is no room for defeatism. For instance, we hear men in business talk as if they believe there always will be unemployment. That is not the kind of America we want and it is not the kind of America business can build. It is the kind of attitude on which political planners thrive.

"We need to get a conception of business as a great builder. Too often we hear the expression that there are no more frontiers. The trouble is that we think of a frontier as something inviting. No frontier is of that order. It is too bad when men think just enough to become confused."

### Dies on "Fifth Column"

Dies described activities of a "fifth column" in America, confining his proof to the record of the committee of which he is chairman.

Before going into his portrayal of conditions in the United States, Dies recounted the effectiveness of agents of German and Russian governments previous to invasion of the European nations which have been conquered.

To show what has taken place in the United States, he quoted from the record of exposures of the committee. He cited creation of the Worker's Alliance, following the congress of the Communist party in Moscow in 1937, which had 600,000 members; the American League Against War and Fascism, the National Negro Congress, and the Communist party organization in the United States, which he said has 20,000,000 members and an income of $10,000,000.

As remedies to prevent formation of such organizations, Dies recommended that business be active in teaching Americanism to its workers and to immigrants.

## Byles Continues as A. P. I. President; Boyd as Executive Head, and Hill as Production Chairman

ALL officers of the American Petroleum Institute were re-elected at the twenty-first annual meeting of the association. This means that Axtell J. Byles, president since 1933, will continue in that capacity. Other officers are W. R. Boyd, Jr., executive vice president; Lacey Walker, secretary and assistant treasurer; George A. Hill, Jr., Houston Oil Company of Texas, Houston, vice president for production; J. Howard Pew, Sun Oil Company, Philadelphia, vice president for refining; E. V. Weber, Eureka Oil Company, Cincinnati, vice president for marketing; O. D. Donnell, Ohio Oil Company, treasurer, and J. S. Cooke, assistant secretary.

Two changes were made in the personnel of the executive committee, H. D. Collier, Standard Oil Company of California, San Francisco, succeeding the late W. H. Berg, of the same company, and Reese Taylor, Union Oil Company of California, Los Angeles, succeeding L. B. Simmons, Rock Island Refining Company, Duncan, Oklahoma.

Reelected members of the executive committee are J. A. Brown, Socony-Vacuum Oil Company, New York; Robert H. Colley, The

[*Continued on page 54*]

# Gas Lift Results In Oklahoma City Field

By S. F. SHAW, Consulting Engineer

**PART I**

**THE usual time for a production method to be described and discussed is at the time when operations are in full swing and the future is viewed in the highest degree of optimism. This article follows a different procedure in reviewing the results of an important method in a large field after these operations have passed largely into history, and the results can be reviewed in retrospect as to successes, and the reasons for such results can be analyzed better at this time than when operations were at peak load.**

**This is the first of a series of two parts on gas lift operations at Oklahoma City. The second installation is to be published immediately.**

THE Oklahoma City field was the first large deep producing area to use gas lift operations to any great extent. The success, troubles and application technique of the method in this field constitutes a valuable contribution to oil field practices; for it is probable that in no other pool has there been an opportunity to make observations on gas-lift operations over so wide a range of conditions.

The Oklahoma City field was discovered December 4, 1928, when Indian Territory Illuminating Oil Company-Foster Oklahoma City 1 was completed in the Arbuckle limestone at depth of 6402 feet for 4950 barrels.[1] Developments spread until there was a total of about 111 wells in this zone, which to date have produced about 17,500,000 barrels of oil. The average initial production of these 111 wells was about 9500 barrels per day per well.

The Lower Simpson sand zone was discovered on June 27, 1929, by Coline Oil Corporation's Olds 1, which came in at a depth of 6377 feet for an initial of 4173 barrels per day. The initials in this zone averaged about 7300 barrels per day, and the total recovery from this zone to July 1, 1940, has been about 108,000,000 barrels from approximately 525 wells.[2]

The discovery well in the Wilcox sand was completed June 24, 1930, by Indian Territory Illuminating Oil Company's Mary Sudik 1 at 6472 feet, which blew out while drilling, and made an estimated 40,000 to 60,000 barrels per day. Sudik 1 is situated in the south part of the zone. The discovery well in the north part of the Wilcox zone was Hall & Briscoe's Holmes 1, completed May 27, 1930, at 6419 feet for 8511 barrels of oil in 12 hours.

Somewhat more than 800 wells have been completed in the Wilcox zone, and aggregate production to July 1, 1940, was about 357,000,000 barrels.[2] A few wells are being drilled at the present time in this zone down the flank of the structure. Initials in the Wilcox zone reached a maximum of approximately 100,000 barrels per day per well.

### Conditions Affecting Gas-Lift

The early wells in the Oklahoma City field were completed with casings of 6⅝ inches and 7 inches O.D. The first wells in the Wilcox zone also were completed with these smaller casing sizes, but when it was observed that high potentials could be established in wells of this zone,[3,4] a large number of wells afterward were completed with casings of 8⅝ inches, 8 inches and 9⅝ inches O.D. for the triple purpose of establishing maximum potentials; producing at high capacity with gas-lift and electrical submerged centrifugal pump; and reducing to a minimum the loss of time and hazard resulting from clean-out and fishing jobs.

Casing was set at the top of the producing horizon. Depth of wells was approximately 6500 feet. Initial reservoir pressure was approximately 2600 pounds per square inch. The gravity of the oil in the early days was about 38 to 42 degrees A.P.I. as delivered to the stock tanks, and the dissolved gas content in the reservoir was on the order of 800 to 1000 cubic feet per barrel of oil. The thickness of the sand in the Wilcox zone was from a few feet at the upper edge of the sand, to 200 feet or more at the lower edge before reaching the water table. The average thickness of this sand is perhaps about 100 feet. Porosity of the Wilcox sand is rather high, ranging from about 20 to 25 percent or even higher, and permeability is high, ranging from 224 to 2500 millidarcys.[5]

The oil in the Arbuckle zone was quickly followed by water under high hydrostatic head; also in the lower Simpson zone, water quickly followed the oil in the producing horizon and maintained the pressure at a fairly high point. Water invaded the Wilcox sand in certain areas, but for the most part the quantity was not great, much to the surprise of nearly everybody.

There appeared to be no hydrostatic head of consequence, and in much of the Wilcox zone water has not made its appearance even when a vacuum of 5 to 10 inches of mercury is maintained at the top of the sand. It is under this condition of low water content, and with vacuum maintained on the casing head, that the field is now extracting the major part of its present production, amounting to nearly 100,000 barrels per day.

At one time or another in the history of the Oklahoma City field, three general types of gas-lift have been employed as follows:

1. Continuous, or Straight Gas Lift.
2. Combination Gas-Lift.
   (a) With Plunger-Pump.
   (b) With Electrical Sub-

**TABLE 1**
**Gas-Lift Factors in Wells in the Arbuckle Zone.**

| YEAR | Barrels Oil | Gas-Factors per Barrel of Oil | | |
|---|---|---|---|---|
| | | Input | Output | Gas-Oil Ratio |
| 1930 | 105,994 | 7,648 | 11,848 | 4,200 |
| 1931 | 116,634 | 5,988 | 9,042 | 3,052 |
| 1932 | 184,421 | 9,012 | 11,859 | 2,846 |
| Total and Average | 407,049 | 7,791 | 11,049 | 3,259 |

**TABLE 2**
**Gas-Lift Factors in Wells in the Lower Simpson Zone.**

| YEAR | Barrels Oil | Gas-Lift Factors per Barrel of Oil | | |
|---|---|---|---|---|
| | | Input | Output | Gas-Oil Ratio |
| 1930 | 65,933 | 2,662 | 3,771 | 1,109 |
| 1931 | 427,892 | 1,718 | 3,034 | 1,316 |
| 1932 | 806,735 | 5,007 | 6,850 | 1,842 |
| Total and Averages | 1,300,560 | 3,806 | 5,438 | 1,632 |

merged Centrifugal Pump.

(c) With Hydraulic Pump.

3. Intermittent Flow.

(a) Gas injected through the Tubing; Production through the Casing, with no Chamber or Valves at the Bottom of the Well.

(b) Gas injected through the Tubing; Packer and Standing Valve, with and without Chamber, or Extension; production through the Casing.

(c) Plunger-Lift.

### Continuous Gas-Lift

Wells were produced on natural flow as long as this method was able to establish maximum potentials and also as long as the wells could be produced at rates considered satisfactory. Owing to faulty conditions, the discovery well in this field did not flow naturally in a satisfactory manner, and gas-lift was applied. But in the course of time, well conditions were improved and natural flow was employed.

One by one, wells in the Arbuckle zone ceased to flow naturally, due largely to invasion of water, and were placed on gas-lift. They continued on this method until the percentage of water became too great to permit profitable operation, after which they were abandoned. Water increased to 90 percent or more while yet on gas-lift.

Fluid levels in the Arbuckle zone built up rapidly when wells were closed down for any reason. And, it was difficult or impossible to start them again with the available gas pressure, consequently the introduction of automatic "kick-off" valves inserted in the tubing couplings made rapid headway. Gas-factors employed in a few wells in the Arbuckle zone are given in Table 1.[6]

These factors must have applied only to the oil production and not to the water lifted, otherwise it is difficult to understand how gas-factors could be so high on wells producing on gas-lift. Practically no other method than natural flow and straight gas-lift was employed in wells in the Arbuckle zone due to encroachment of large quantities of water. Had there been an inexpensive method of water disposal, production from the Arbuckle zone could have been continued for perhaps a long time on straight gas-lift due to the high flowing pressures maintained by the encroaching water.

Wells in the Lower Simpson zone were placed on continuous gas-lift as soon as natural flow became unsatisfactory, beginning with the year 1931. Big compressor plants were installed to handle the operations in a large number of these wells. In this zone water encroachment spread fairly rapidly, although not at the same rate as in the Arbuckle zone. "Kick-off" valves were installed in many of these wells to start them to flowing. Continuous gas-lift was usually employed following natural flow, and a few wells are yet being produced by this method in the Fair Grounds section of the Lower Simpson zone.

Data on gas-lift factors in wells in the Simpson zone are given in Table 2.[6,7]

Data on two of the smaller wells opened at a late period in the Lower Simpson zone and produced by continuous gas-lift, beginning with the time when the wells were completed, are given in Table 3.

Miller 1 was completed with 9⅝-inch casing, and 3-inch tubing was run to a point close to the bottom. Some tests were made to compare the use of 3-inch tubing employed as the eductor with that of the annular space. A test made through the annular space resulted in production of 299 barrels per day with flowing pressure of 15 pounds per square inch, employing 2,485,000 cubic feet of input gas per day at 8300 cubic feet of input gas per barrel. The flow was then reversed through the 3-inch tubing and with 180 pounds per square inch flowing pressure, production was 273 barrels per day, while the input gas required was 724,000 cubic feet per day or an input gas-factor of 2650 cubic feet per barrel. The quantity of gas when flowing through the tubing was reduced to 2650 cubic feet per barrel, but the

**TABLE 3**
**Gas-Factors in Gas-Lift Wells Completed at Late Date in the Lower Simpson Zone.**

| Well | Month | Barrels Oil | Barrels Fluid | Percent Water | Cu. Ft. Input Gas | | Cu. Ft. Output Gas | | Cu. Ft. Formation Gas | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | M. Cu. Ft. Month | Per Barrel | M. Cu. Ft. Month | Per Barrel | M. Cu. Ft. Month | Per Barrel |
| Jordan 1 | May '38 | 7,008 | 10,182 | 36 0 | 76,536 | 7,516 | 90,912 | 8,930 | 14,356 | 1,420 |
| Jordan 1 | June | 4,594 | 8,755 | 47.5 | 88,726 | 10,150 | 94,462 | 10,700 | 6,736 | 550 |
| Jordan 1 | July | 3,363 | 8,394 | 60.0 | 89,831 | 10,680 | 96,612 | 11,500 | 6,681 | 820 |
| Jordan 1 | August | 2,827 | 7,715 | 63.4 | 90,218 | 11,693 | 101,457 | 13,150 | 11,239 | 1,457 |
| Jordan 1 | *June '40 | 1,241 | 13,462 | 90.8 | 80,087 | 5,949 | 87,533 | 6,502 | 7,446 | 553 |
| Miller 1 | March '38 | 8,592 | 8,592 | .... | 38,852 | 4,520 | 48,561 | 5,650 | 9,709 | 1,130 |
| Miller 1 | April | 4,532 | 4,532 | .... | 28,807 | 6,350 | 30,666 | 6,760 | 1,858 | 410 |
| Miller 1 | May | 3,908 | 4,312 | 9.4 | 25,812 | 5,730 | 29,262 | 6,780 | 3,450 | 1,050 |
| Miller 1 | June | 2,742 | 3,375 | 18.7 | 24,285 | 7,200 | 27,469 | 8,130 | 3,164 | 930 |
| Miller 1 | *June '40 | 606 | 3,631 | 83.7 | 34,008 | 9,360 | 45,609 | 12,461 | 11,601 | 3,195 |

* Intermitting at hourly periods.

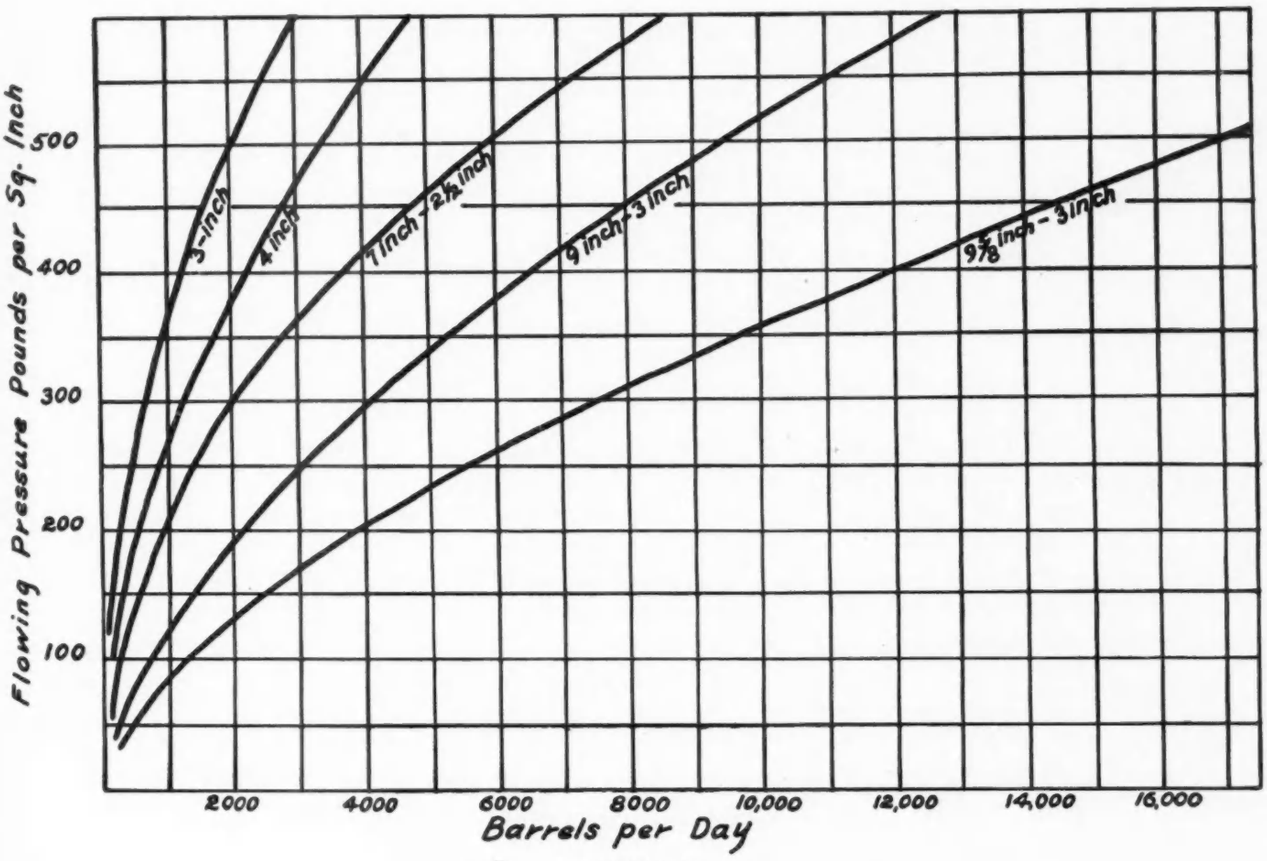


**FIGURE 1**
**Capacity of Eductors in the Oklahoma City Field**

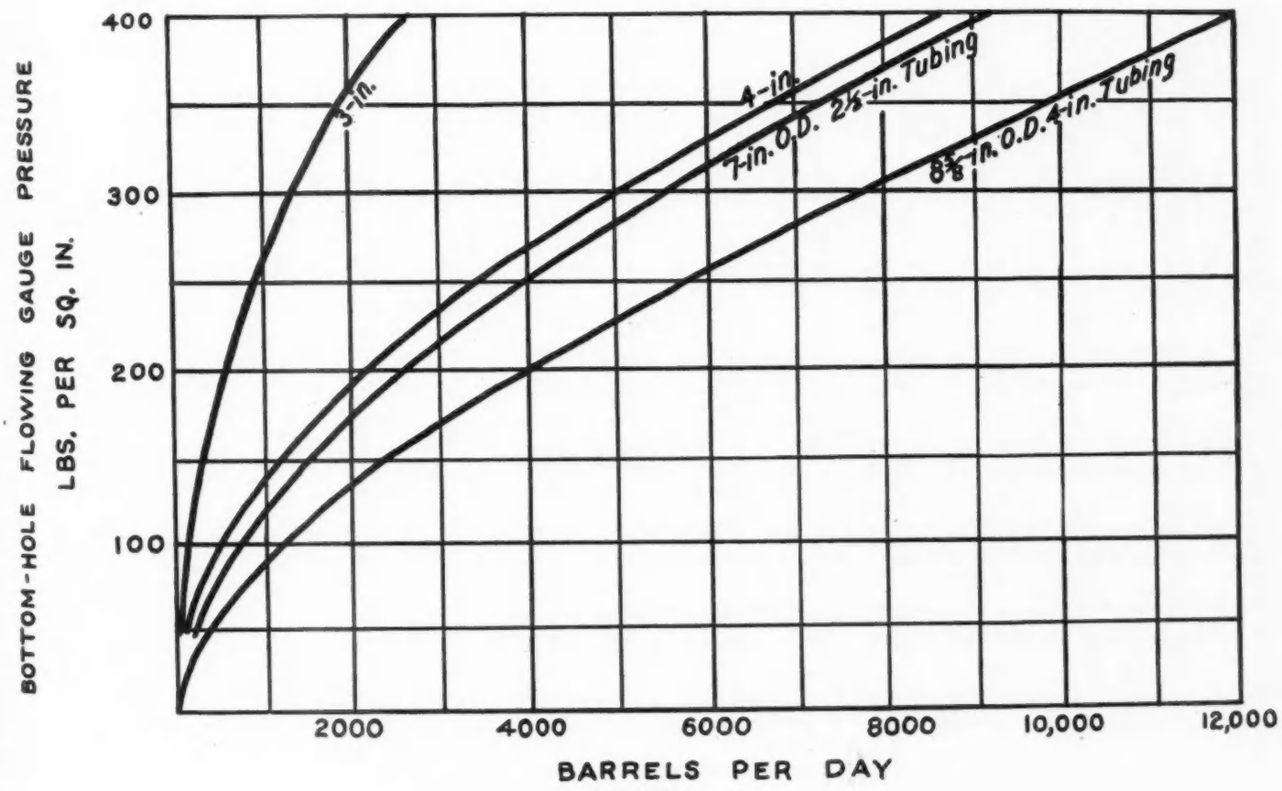


**FIGURE 2**
**Capacity of Eductors in the Seminole Field**

energy in this 2650 cubic feet of gas at the higher flowing pressure of 180 pounds expanding to atmospheric pressure was 14,493,000 foot pounds of work required to lift a barrel; as compared with the energy of 12,359,000 foot pounds in 8300 cubic feet per barrel when flowing through the casing at 15 pounds flowing pressure. Thus it may be seen that a mere statement of the number of cubic feet of gas required to lift a barrel of liquid may not possess the same comparison when considering the foot pounds of work required to lift the liquid. Production remained at nearly 300 barrels per day whether the flowing pressure was 180 pounds or 15 pounds per square inch, due to the tight character of the producing formation, although starting pressures were as high as 800 to 1000 pounds per square inch after the well had been closed down for a few days.

It may be observed in such a case why continuous gas-lift could be employed profitably in a formation having high pressure but low permeability, when production of oil had declined to a low daily output; as compared with a formation having a high permeability but where reservoir pressures have declined to a low point.

The zenith of continuous gas-lift was reached in the Wilcox zone in the Oklahoma City field after natural flow ceased to perform satisfactorily. Nearly all wells in this zone, some 800 in number, were placed on continuous flow at one time or another. Many interesting and important tests were made with various sizes of eductors and with various flowing pressures, and a set of data was obtained comparable with that previously obtained in the Seminole field[8] where wells were only 4000 to 4300 feet in depth.

Wells in Oklahoma City were produced on continuous gas-lift through eductors of 3-inch, 4-inch, 6⅝-inch, 7-inch, 8⅝-inch, 9-inch and 9⅝-inch diameters, at rates ranging from 100 barrels to 12,000 barrels per day in the largest diameters and under flowing pressures ranging from 15 pounds per square inch to 500 pounds per square inch. Probably no other field has offered an opportunity to make observations on gas-lift operations over so wide a range of conditions.

The capacity of eductors of various diameters in the Oklahoma City field at depth of approximately 6500 feet are given in Figure 1,[9] which compares with capacities of eductors in the Seminole field at about 4000 feet, as given in Figure 2.[8]

The output gas-factors required to lift a barrel of oil in the Oklahoma City field at depth of 6500 feet compares with those required in the Seminole field,[10] at about 4000 feet, as given in Figure 3, when flowing at given maximum rates per day. These output factors apply approximately to all diameters of casing, but it should be observed that a given production for one diameter of eductor requires a different flowing pressure from that of the same production for another eductor diameter. Therefore the lifting efficiencies are quite different for various diameters of eductors even when employing the same output gas-factor to lift a barrel of oil at equal capacities. However, output gas-factors, capacities, and lifting efficiencies in a given field vary in different size eductors even when the flowing pressures are the same.

Gas-factors for a few wells in the earliest period of gas-lift production in the Wilcox zone are given in Table 4.[6,7]

Gas-oil ratios for wells completed in the Wilcox zone for several years are given in Table 5.[11]

Up to December, 1933, both in-

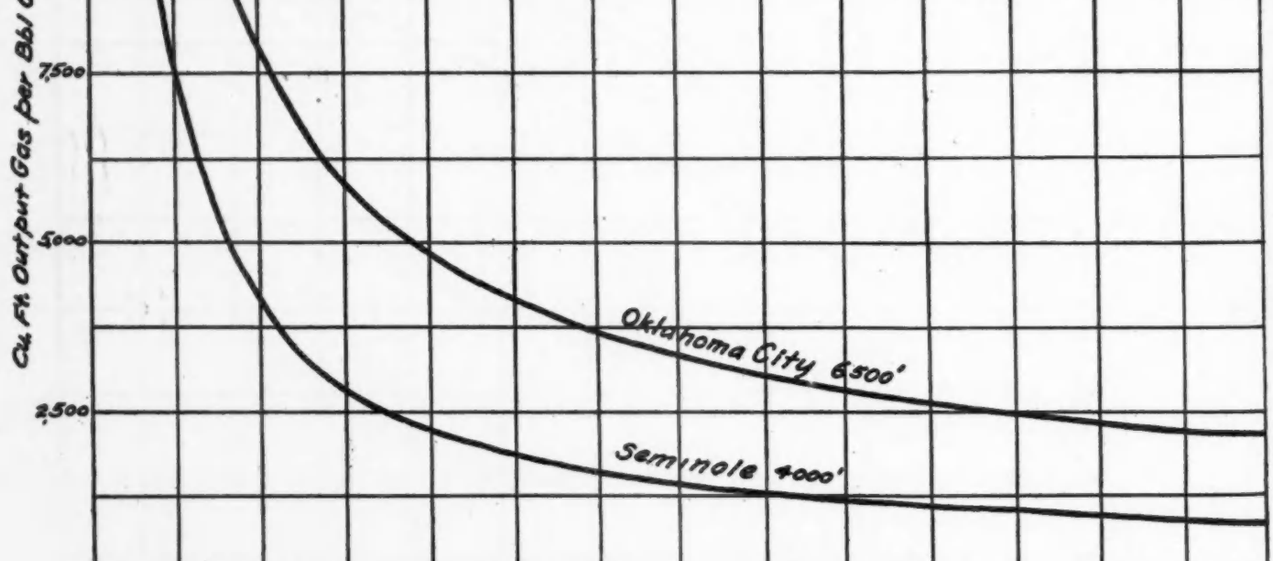


**FIGURE 3**
**Cubic Feet Output of Gas Required to Lift One Barrel of Oil at Maximum Capacity**

put and formation gas ratios are included in the gas/oil ratios, therefore, do not permit of analysis during that period. Beginning with December, 1933, only formation gas was considered as the gas/oil ratio. It will be noted that, in general, there was an increase in the output ratio to the end of 1933. This is only to be expected inasmuch as wells were being put on gas-lift in gradually increasing number, the fluid level was declining, and the input gas-factors were of necessity increasing. The actual formation gas/oil ratio would seem to have started to decline at some time in 1932 or 1933. It will be noted also that after 1933, there was a gradual decrease in the formation gas/oil ratio, and this has continued up to the present time as will be observed from data in Tables 6 and 8. Gas/oil ratios of wells in three 160-acre tracts in the north end of the Wilcox zone for five yearly periods are as given in Table 6, [11, p. 172]

It will be noted that the tracts higher on the structure for a given period always were accompanied by a higher gas/oil ratio. This would seem to indicate that under restricted production, the gas being released from the oil under the gradually reducing reservoir pressures was migrating up the structure. When the wells structurally higher were shut in, gas-caps apparently were formed, thus increasing the trouble of mounting gas/oil ratios in these higher wells, unless all the wells throughout the zone were produced at maximum rates.

The quantity of gas necessary to lift a barrel of oil under maximum capacity conditions in the Oklahoma City field is given in Table 7.[9, p. 137]

From the ratios given in Table 6 compared with the requirements of gas as given in Table 7, it would seem that no artificial lifting method would be necessary in that area of the field until the year 1934, and then only in Tract A, where ratios had declined to 1158 cubic feet per barrel. It must be remembered, however, that these wells were produced for short periods of time, then closed in, or produced under back pressures, which made the requirements of output gas much greater than those stated in Table 7. Under these conditions wells would not start to flow naturally when opened after having been shut in for a time, or when back pressures were applied. Consequently gas-lift was introduced considerably earlier than would have been necessary had it been possible to observe proper gas-lift principles as applied to wells flowing naturally.

**TABLE 7**
**Cubic Feet of Gas Required to Lift One Barrel of Oil at Maximum Capacity in the Oklahoma City Field under a Given Flowing Pressure.**

| Flowing Pressure Lbs. per Square Inch | Cubic Foot Output Gas Required per Barrel |
|---|---|
| 1,500 | 110 |
| 1,200 | 180 |
| 1,000 | 290 |
| 800 | 430 |
| 600 | 700 |
| 500 | 960 |
| 400 | 1,350 |
| 300 | 2,040 |
| 200 | 3,100 |
| 100 | 6,400 |

Gas/oil ratios, along lines of wells that were arranged in order from structurally high wells to wells almost at the lowest part of the producing formation, for years later than those given in Table 6, are given in Table 8.

Line 1 in Table 8 seems to have a rather low gas/oil ratio, even though on the highest point of the structure of any of these wells. The reason for this is not clear. As a rule, it will be observed that the ratios decrease as the lower part of the structure is approached. The higher gas/oil ratios in some of the lines in the table were unduly influenced by flowing wells with abnormally high gas/oil ratios. These occurred for the most part in wells with small casings, where paraffin depositions gradually choked the wells, under which condition the gas/oil ratios were very high. These wells at various periods were produced on natural flow, gas-lift, combination centrifugal pump, hydraulic pump and beam pump, depending upon the conditions existing.

Considerable alarm has been evinced in the past over the theory that the oil will become viscous and not flow into the wells readily when the gas content has been reduced to a low point, but in this

**TABLE 4**
**Gas-Factors to Lift a Barrel of Oil in the Wilcox Zone.**

| YEAR | Barrels Oil | Gas-Factors, Cu. Ft. per Barrel | | |
|---|---|---|---|---|
| | | Input | Output | Gas-Oil Ratio |
| 1931 | 17,371 | 211 | 724 | 512 |
| 1932 | 135,394 | 369 | 903 | 534 |
| Total and Average | 152,765 | 351 | 883 | 532 |

**TABLE 5**
**Gas-Oil Ratios in Wells Completed Generally in the Wilcox Sand.**

| YEAR | Barrels of Oil | M. Cu. Ft. of Gas | Cu. Ft. per Barrel Gas-Oil Ratio |
|---|---|---|---|
| 1930 | 171,734 | 280,404 | 1,635 |
| 1931 | 7,055,706 | 9,799,486 | 1,390 |
| 1932 | 5,084,779 | 15,873,386 | 3,120 |
| 1933 | 13,916,957 | 45,095,598 | 3,230 |
| 1934 | 12,626,229 | 28,526,435 | 2,250 |
| 1935 | 13,914,857 | 23,344,256 | 1,675 |

**TABLE 6**
**Gas-Oil Ratios in Three 160-Acre Tracts in Order from High to Low Point, Structurally, in the Wilcox Zone**

| Tract | 1930 | | 1931 | | 1932 | | 1933 | | 1934 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Lbs. | Ratio | *Lbs. | Ratio | *Lbs. | Ratio | *Lbs. | Ratio | *Lbs. | Ratio |
| C | 2,500 | 849 | 2,200 | 1,698 | 1,900 | 8,777 | 1,000 | 5,852 | 350 | 8,000 |
| B | 2,500 | 725 | 2,250 | 1,152 | 1,850 | 2,083 | 1,200 | 2,759 | 400 | 2,196 |
| A | .... | .... | 1,400 | 1,337 | 1,900 | 1,476 | 1,200 | 1,864 | 400 | 1,158 |

* Lbs. per Sq. In. Reservoir Pressure.

**TABLE 8**
**Gas-Oil Ratios for the Years 1935-1939, Advancing Down the Flank of the Structure of the Wilcox Zone in One Section of the Field.**

| LINE | 1935 | 1936 | 1937 | 1938 | 1939 |
|---|---|---|---|---|---|
| 1 | .... | .... | .... | 760 | 937 |
| 2 | .... | .... | .... | 2,520 | 2,200 |
| 3 | 1,660 | .... | .... | 1,160 | 1,110 |
| 4 | .... | .... | .... | 1,440 | 850 |
| 5 | .... | 493 | 338 | 500 | 373 |
| 6 | 2,780 | 1,755 | 279 | 273 | 277 |

**FIGURE 4**
**Elevated separator for reducing back pressures**

field, where the gas/oil ratios have been reduced to from 100 to 300 cubic feet per barrel on the down-dip part of the structure, wells are making up to 1200 barrels per day.

### Effect of Back Pressures on Continuous Gas-Lift Operations

In natural flow, usually more gas accompanies the oil from the formation than is necessary to lift the oil at maximum capacity or at maximum efficiency. Natural flow usually declines and passes through the rates of maximum capacity and efficiency, but the period of operation at those rates is usually very short. Any sudden deviation in the well below these rates is likely to cause the well to cease flowing altogether, or to flow in a heading condition if it flows at all. Natural flow, therefore, is not susceptible to the rigid changes in relation between quantities of gas and oil as is artificial gas-lift, where any quantity of gas can be admitted to the eductor at the will of the operator.

Tests with back pressures on gas-lift can be so conducted that they will show definitely the effect resulting from use of back pressures, whereas tests with back pressures on natural flow have little if any definite significance from an energy standpoint. Some tests made with back pressures on wells in the Oklahoma City field are given in Table 9.

When varying the back pressures in these tests, efforts were made to maintain the input gas at the same rate as nearly as possible. It will be noted in the series of **A** tests that with the same quantity of input gas and with back pressures gradually increased, the production of oil gradually decreased, and the input and output gas-factors gradually increased, as a rule. In other words, as the energy in the output gas was gradually nullified by increasing the back pressure, thereby allowing gas to escape from the eductor without utilizing the energy contained, the quantity of oil that could be lifted became reduced without reducing the quantity of input gas correspondingly. In natural flow, when a back pressure is increased the quantity of oil, as a rule, is reduced as also may be the quantity of gas associated with the oil, but no definite control can be maintained over the quantity of gas employed for the lifting purpose, compared with the oil entering the well. As long as there is an excess quantity of gas associated with the oil, the well will flow naturally, but when the formation gas becomes reduced too greatly the flow will cease, or if any flow at all results it will take place as a heading action.

Back pressures on wells can be set up by means of chokes, or by the manipulation of the discharge valve at the well head; by bottom-hole chokes that set up a back pressure at the bottom of the well, but which do not control the pressure at the top of the well; or by conditions within the eductor itself. The use of a tubing of small diameter is in effect a choke and the effect on deep wells of using small tubing through which to flow the wells is shown by the fairly uniform initials being obtained in deep wells, whatever be the condition within certain limitations of sand, such as porosity, permeability, thickness of sand, etc.

For reducing back pressures on wells in the Oklahoma City field for the purpose of increasing production and for reducing the quantity of gas required to lift the oil, two methods are employed. One method consists in elevating the separators similar to the method shown in Figure 4 in which the

**TABLE 9**
**Data on Back Pressure Tests on Gas-Lift Wells in the Oklahoma City Field.**

| No. | Eductor Diameter | Barrels Per Day | Back Pressure Lbs. | Cu. Ft. Input Gas | | Cu. Ft. Output Gas | | Cu. Ft. Formation Gas | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | M. Cu. Ft. Per Day | Per Barrel | M. Cu. Ft. Per Day | Per Barrel | M. Cu. Ft. Per Day | Per Barrel |
| A-1 | 9 5/16" | 3.737 | 3.5 | 4.368 | 1.172 | 6.061 | 1.626 | 1.258 | 454 |
| A-2 | 9 5/16" | 3.354 | 9.5 | 4.330 | 1.298 | 5.721 | 1.706 | 1.391 | 408 |
| A-3 | 9 5/16" | 3.018 | 15 5 | 4.330 | 1.401 | 5.784 | 1.920 | 1.454 | 519 |
| A-4 | 9 5/16" | 2.900 | 18.5 | 4.300 | 1.480 | 5.217 | 1.800 | 917 | 320 |
| B-1 | 9" | 1.679 | 6 | 5.300 | 3.140 | 6.020 | 3.590 | 720 | 450 |
| B-2 | 9" | 1.545 | 15 | 5.300 | 3.430 | 6.020 | 3.900 | 720 | 470 |
| B-3 | 9" | 1.385 | 25 | 5.520 | 4.000 | 6.020 | 4.350 | 500 | 350 |
| B-4 | 9" | 1.074 | 37 | 5.370 | 5.000 | 6.020 | 5.580 | 650 | 580 |
| C-1 | 9" | 924 | 1.5 | 3.240 | 3.490 | .... | .... | .... | .... |
| C-2 | 9" | 777 | 10 | 3.300 | 4.250 | .... | .... | .... | .... |
| D-1 | 9" | 1.214 | 2½ | 4.300 | 3.550 | .... | .... | .... | .... |
| D-1 | 9" | 840 | 22 | 4.350 | 5.180 | .... | .... | .... | .... |

platform is sufficiently high that the oil will gravitate to the stock tanks. In the other method, a blow-case is installed as shown in Figure 5. In the second method, the oil flows out of the separator into a small horizontal tank connected to the separator through a pipe with check valve between. In filling the blow case, a float is raised which operates to admit gas under low pressure into the top of the blow-case, thus displacing the oil from the blow case into the stock tank.

Instances of the choking effect of paraffin depositions on the flow through the eductor in the Oklahoma City field were noted. A well 6500 feet in depth on natural flow produced 750 barrels of oil per day with gas/oil ratio of 4680 cubic feet per barrel, and became partly choked with paraffin until the production was reduced to 62 barrels per day, and the gas/oil ratio was 24,650 cubic feet per barrel. When the paraffin was scraped out, the well resumed its natural flow of 750 barrels per day with gas/oil ratio of approximately 4700 cubic feet per barrel. Another well producing 1100 barrels per day with gas/oil ratio of 2530 cubic feet per barrel gradually became choked with paraffin to the point where production was reduced to 139 barrels per day with gas/oil ratio of 12,350 cubic feet per barrel. When the paraffin was scraped out, production increased to 968 barrels per day, and the gas/oil ratio was reduced to 3680 cubic feet per barrel.

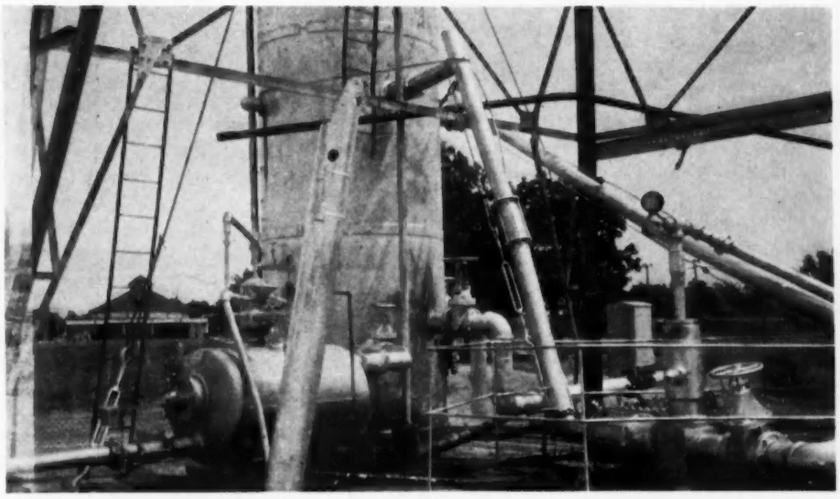

**FIGURE 5**
**Blow case installation for reducing back pressures**

In order to make observations of the relationship between flowing pressures, capacities of eductors and output gas-factors over the period of the gas-lift life of the well

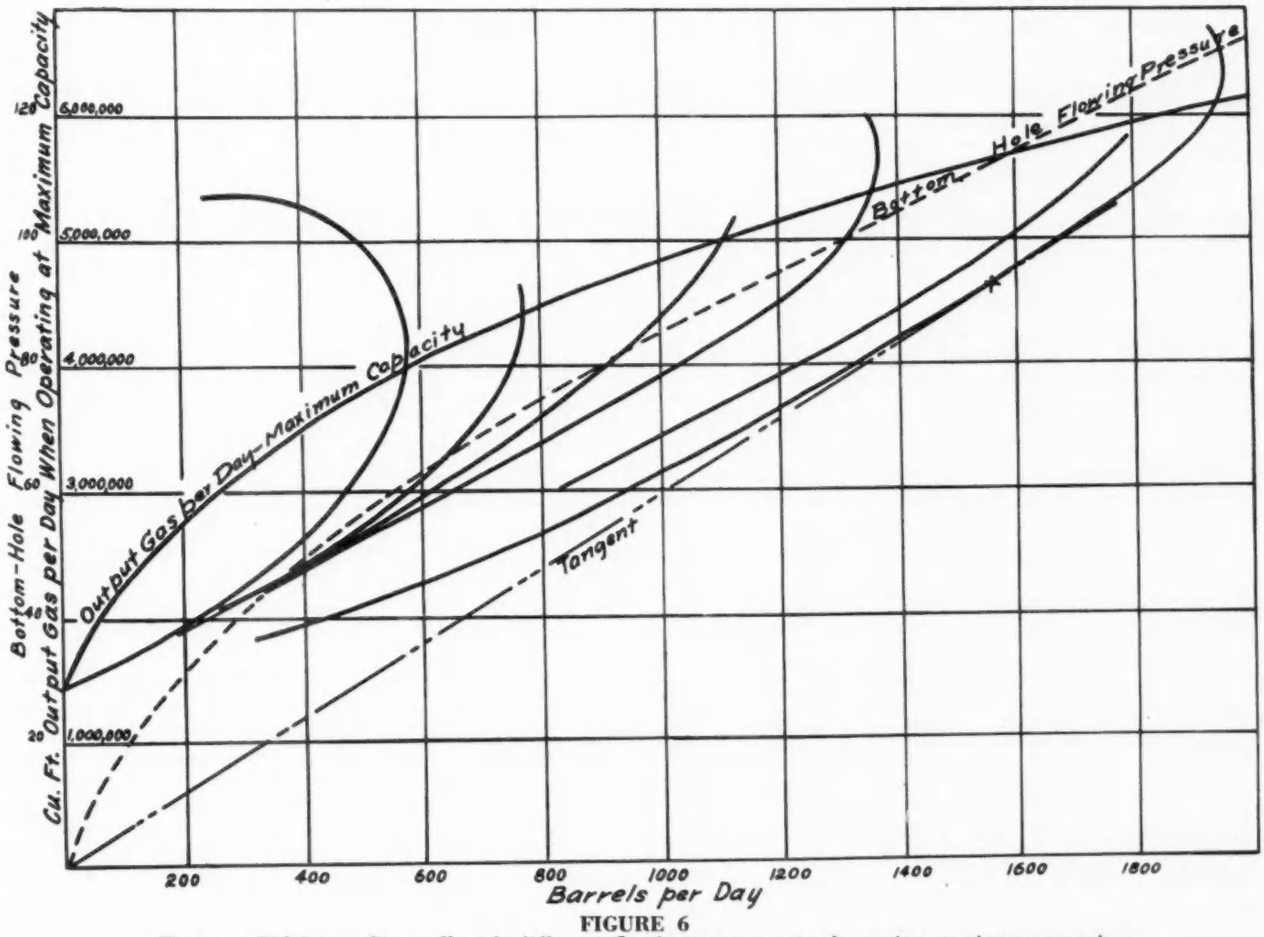


**FIGURE 6**
**Tests on Oklahoma City well with different flowing pressures to determine maximum capacity**

when reservoir pressures and flowing pressures were gradually declining, several series of tests were made in these wells in the Wilcox sand at Oklahoma City. The results of a set of these tests made on one well with 9⅝-inch casing with 3-inch tubing are shown in graphical form in Figure 6. [9, p. 136] It will be noted in the graphs that as the flowing pressure declined due to decline in reservoir pressure, the total quantity of output gas required to produce the oil at maximum capacity also declined, but not in arithmetical ratio with the decline in productive capacity of the eductor. Consequently as the production declined, the output gas-factor gradually increased. This relation is characteristic of all continuous gas-lift operations where the submergence is less than 65 percent.

A knowledge of the effect of decline in capacity of eductors on continuous gas-lift in various fields, which can be established by tests, will enable the operator to determine whether, or when, he will find it necessary to change the lifting method from continuous gas-lift to some other method. This knowledge may save him considerable uncertainty and loss in production of oil. For instance, the earlier tests on various wells in Oklahoma City Wilcox wells indicated that with a flowing pressure of 35 pounds per square inch, the maximum capacity of a 9⅝-inch casing would be about 200 barrels per day, with output factor of approximately 10,000 cubic feet per barrel. Allowables at one time in wells of a newly drilled part of the field were 200 barrels per day, and production lifted in other wells in the vicinity indicated that the beam pump or the hydraulic pump would lift more than 200 barrels of oil per day at 35 pounds per square inch flowing pressure. The compressor plant was delivering gas at operating cost of ¾c per thousand cubic feet, consequently the cost of lifting was not sufficiently high to justify a change to another method costing $10,000 to $12,000 for the installation. However, the rate of decline in production due to the declining flowing pressure was such as to indicate that the loss from being unable to make the allowable after flowing pressures declined to less than 35 pounds per square inch would become a serious matter. Therefore, a change was made in the lifting method at this point from continuous gas-lift to hydraulic pump without any loss of time, and the capacity of the well was thereby increased from 200 barrels per day to about 300 barrels per day. Had the allowable been greatly in excess of 200 barrels per day, the preferred method would have been combination gas-lift with electrical, submerged, centrifugal pump, the installation of which would have amounted to about $12,000 in addition to the cost of the compressor plant, which, however, had already been installed and had been paid out some time previously.

### Comparison of Continuous Gas-Lift With Other Methods

During the period immediately succeeding natural flow while reservoir pressures were yet high, it appears that no other known method could compare with continuous gas-lift in the matter of capacity, in simplicity, in cost of lifting, and in absence of trouble.

During this period, the capacity was high, particularly if these wells were completed with large diameter of casing. Reference to Figure 1, illustrates this point. After completion in the Mansion area, most of the wells with reservoir pressures of 400 pounds per square inch would not flow naturally, and where casings of 9⅝ inches were installed, production up to 12,000 barrels per day was obtained on continuous gas-lift. After the tubing had been run, separators installed and properly hooked up, there was scarcely any need for visiting the well for periods of weeks at a time other than for the purpose of making tests. At the time when the Mansion area was first developed, sufficient gas was produced with the oil from the reservoir to assist the gas-lift operations materially, but this quantity of gas interfered seriously with the operation of any plunger pump or centrifugal pump. The cost of operation on gas-lift was low with reservoir pressures at 400 pounds per square inch due to the relatively low quantity of input gas required per barrel of oil.

After flowing pressures declined to 100 pounds per square inch or thereabouts, the oil was of a character that allowed considerable quantities of paraffin to deposit on the walls of the casing and tubing, which reduced the flowing area, and therefore, the capacity of the eductor. This trouble was remedied by flushing a quantity of paraffin solvent, or distillate, down into the casing at regular intervals of time, thus loosening the paraffin which would be lifted at the succeeding discharge of oil, and dropped out in the separator whence it was drawn off at intervals together with any accumulations of sand, into a pit or tank.

In the Oklahoma City field, where the Wilcox sand was very permeable, reservoir pressures declined eventually to the point where the capacity of straight gas-lift, even in the largest diameters of casing, was not sufficient to handle all the oil that would enter the well. It was then found that combination gas-lift, or in some instances intermittent flow, could be employed to obtain a larger daily production at a lower lifting cost than continuous gas-lift, and at this point, straight gas-lift operations were discontinued.

*[To be continued]*

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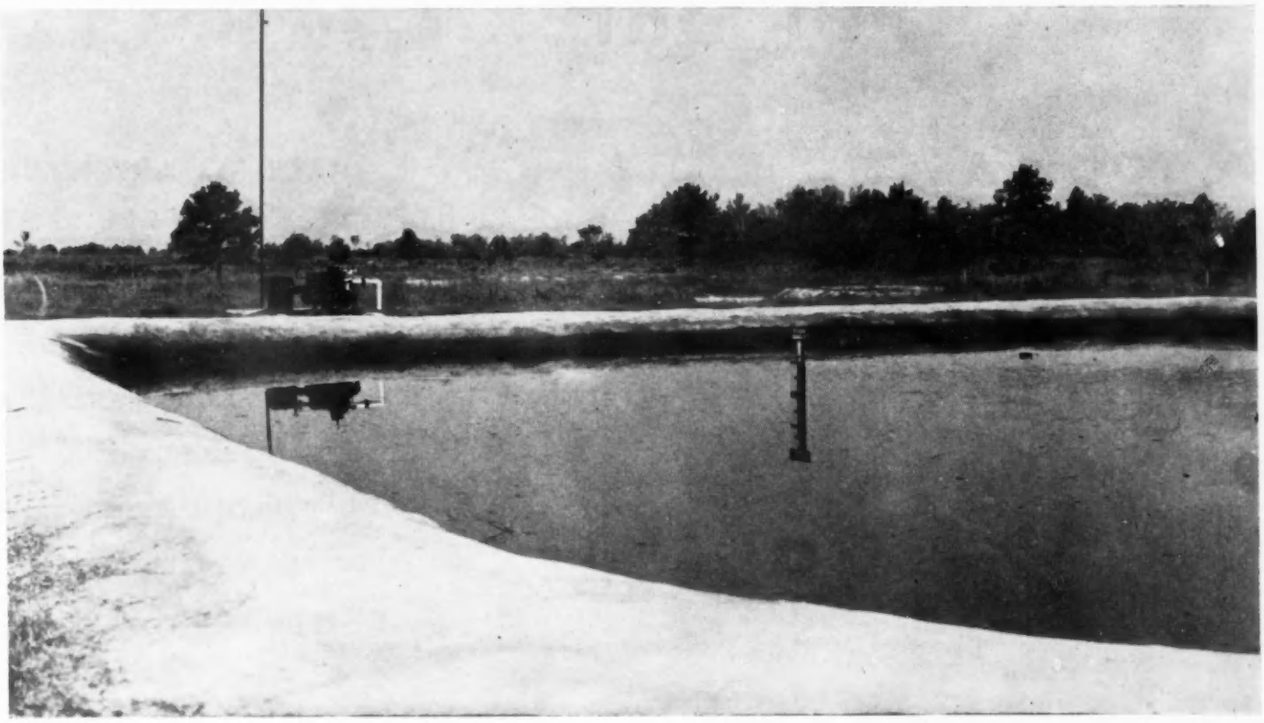

**Part of an open pit is shown, with pump in the background. The lining is a sand and cement composition used to prevent seepage and contact with native soil.**

# Simple Salt Water System Proves Effective

A SIMPLE and effective salt-water-disposal system has been developed in the Tomball, Texas, field by Humble Oil & Refining Company. Three disposal wells are being used, but ultimately five wells will be required to complete the project. The field is under a water drive, and many edge wells around the producing area are affected by the encroachment.

The Tomball area is primarily a farming community, the field proper being extensively inhabited. Since the streams nearby are small, salt-water disposal has become an important consideration in oil producing operations.

Humble Oil & Refining Company holds leases all over the field, which is 7 to 8 miles wide, and the present disposal system is the first part of an extensive project that will be enlarged as production of salt water increases. The company has pioneered this work in the field, and in doing so has learned much through experimentation. Salt-water disposal at its best is not a dainty problem, and because of this nuisance value the injection is carried out with as little effort and expense as possible.

Lined earthen pits are used exclusively for storage of salt water ahead of immediate injection. The first gathering pit finished and one of the three now in use is a rectangular excavation 50 x 50 x 10 feet, with tapered sides and full lining of cement and sand. Though of satisfactory composition, this type of open pit costs about $3600.

The two earthen pits more recently built are round reservoirs 100 feet across, with an effective maximum depth of 10 feet. They are lined wtih stabilized soil, which is composed of asphalt base oil and native sand. This type of lining has proved effective and the cost of an entire pit has been about $1600. Each of these round pits hold about 12,000 barrels of salt water, the sides sloping gently to permit packing the lining in place.

Ordinary earthen pits were tried as storage reservoirs but they were not satisfactory.

An extensive pipe-line gathering system has been laid to supply salt water for the three injection wells. Main gathering lines are of 6-inch construction, with 3- and 4-inch laterals to producing wells. The pipe used is a low-pressure, wood-pitch composition product that is not affected by the salt water. It is composed of a high percentage of wood pulp and a small percentage of pitch. The pipe carries a tapered slip joint that is hammered into

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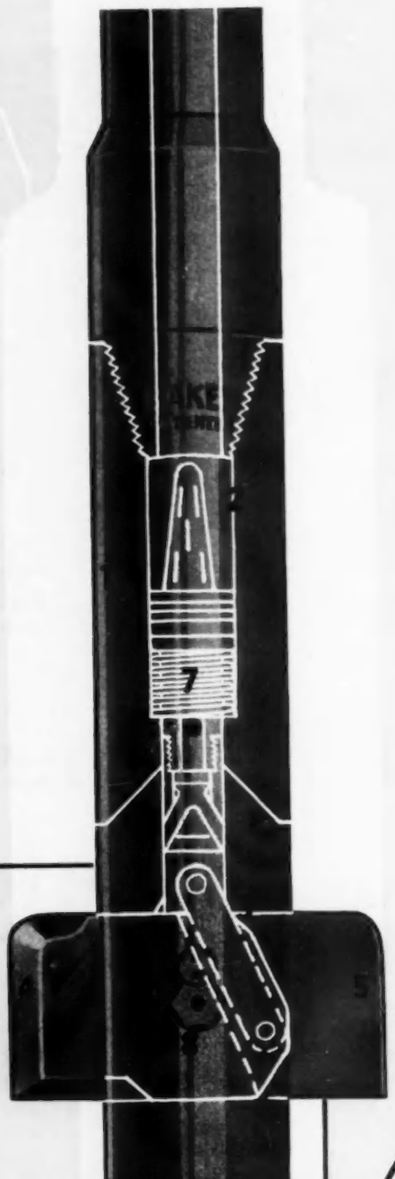

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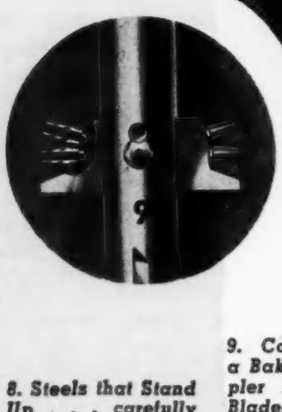

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### BOTTLENECKING THE HOLE FOR BETTER CEMENTING

*1. The Baker Rotary Wall Scraper used to enlarge the hole so that cement will be sure to surround the casing completely and with greater thickness.*

*2. Cement in the enlarged hole forms a uniform plug—and channels which might have resulted from contact of the casing with the wall, have been avoided.*

### REMOVING SECTIONS OF DRILLABLE PIPE

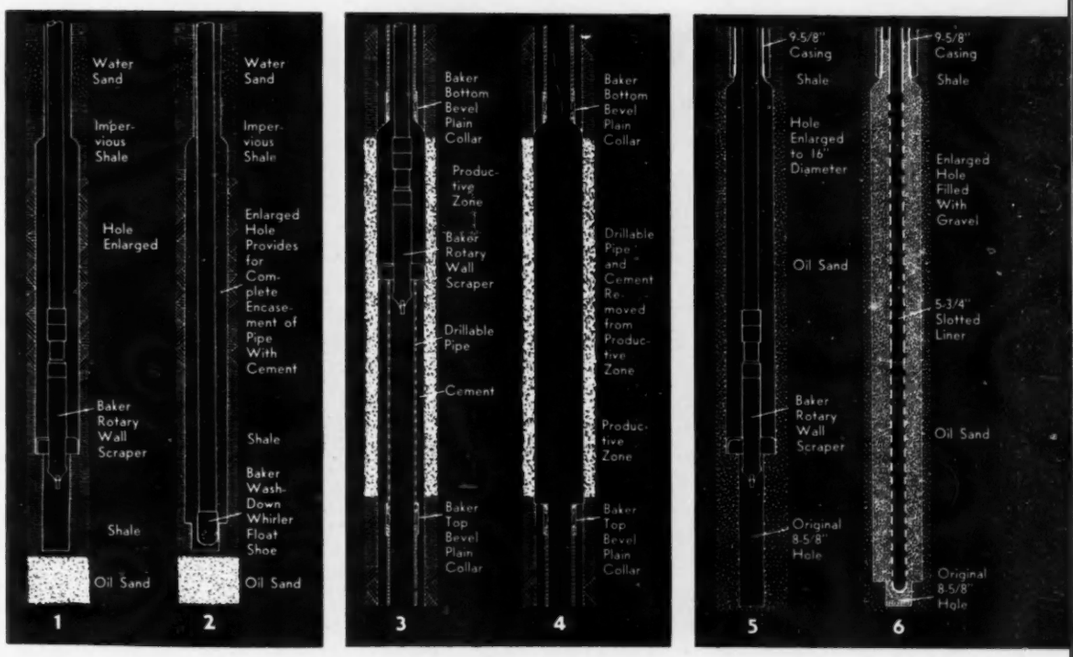
*3. The Baker Rotary Wall Scraper effectively removes both the section of drillable pipe and the cement behind the pipe. The hole is enlarged slightly to clean the face of the oil zone.*

*4. The cemented Drillable Pipe, through the productive zone, has been removed and the well is ready to be completed in this zone. The face of the formation has been scraped clean.*

### ENLARGING HOLE FOR GRAVEL PACKING

*5. The Baker Rotary Wall Scraper is used to enlarge the hole and thus permit packing a substantial amount of gravel around the liner.*

*6. Here is the completed job, with the slotted liner landed and surrounded with gravel in the area enlarged with the Wall Scraper.*

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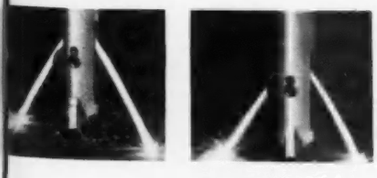
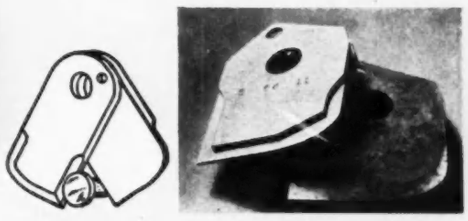


Pump pressure causes the circulating fluid to force an enclosed piston downward thus expanding the blades upward and outward against the formation. By directing the fluid against the blades, the cutting surface is lubricated and cooled, and formation cuttings are circulated out of the hole. Left view shows blades starting to expand; right, blades are fully opened.



If a fragment of metal prevents closing of blades, contact of the top of the blades against the casing shoe results in shearing through or dislodging such obstructions. In actual tests the blades sheared a one-inch steel bolt.

The blades are machined from SAE 4145 Chrome Molybdenum steel forgings with ample recesses for hard facing and setting with Tungsten carbide inserts.

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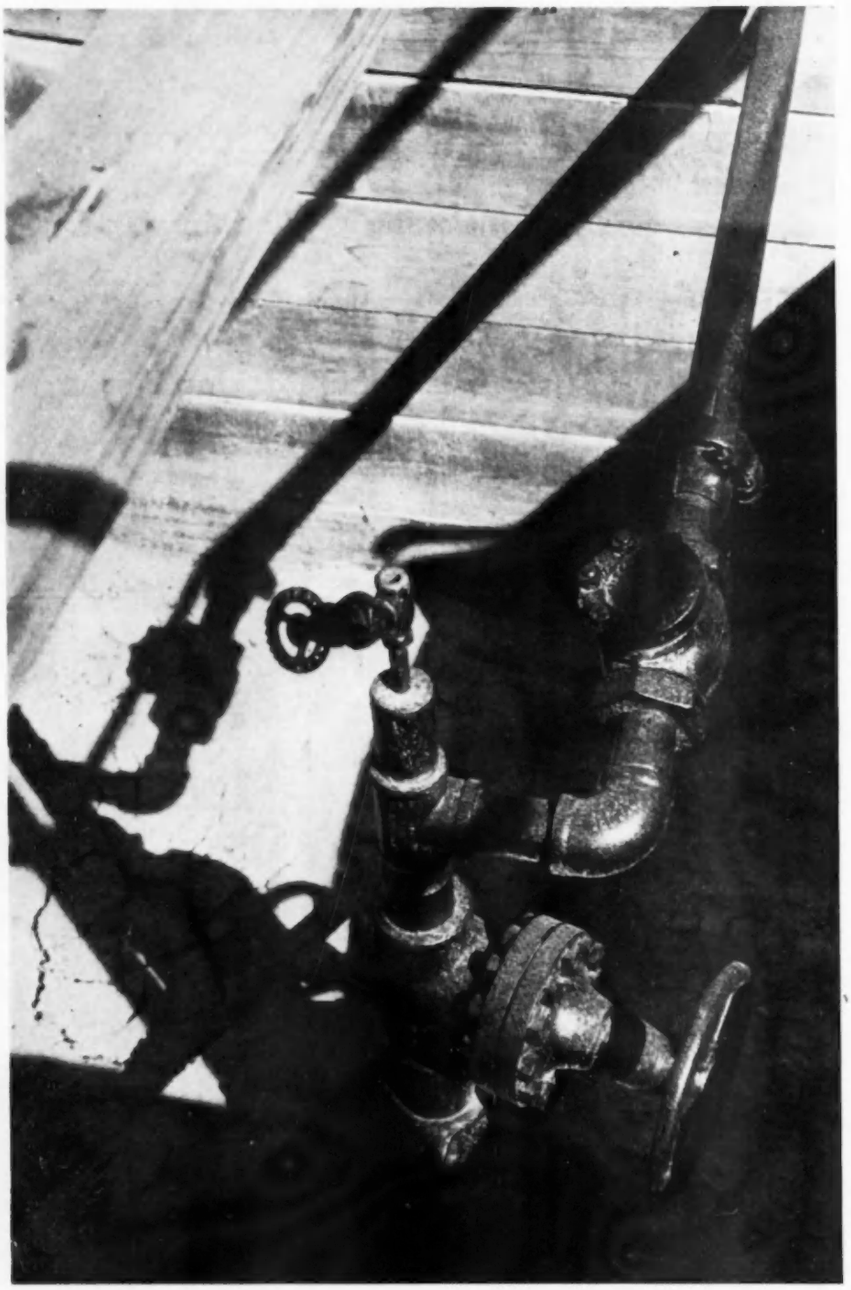
Thousands of runs have demonstrated that Baker Rotary Wall Scrapers combine tremendous strength with minimum overall dimensions. This fact explains why the Scraper can be run through comparatively small diameter casing and then scrape small diameter hole below the casing to a truly amazing diameter. For example, a No. 6 Baker Wall Scraper will run through 9⅝" API Casing readily, and then will ream from a minimum of 9¼" to a maximum of 19" in ¼" steps depending upon the gauge of the blades in use.

# Rotary Wall Scraper



**Surface equipment at the injection well is the simplest possible type. The wellhead is placed in a cellar to provide a natural fluid head from the storage pit.**

position. The pipe is buried at least 18 inches in the ground to provide a cushioning effect that prevents damage from trucks or tractors. About 150,000 feet of the composition pipe is used in the three sizes. It is manufactured in 8-foot lengths and is laid with nominal expense.

The flow to all pits is by gravity from producing wells. The arrangement of the three disposal districts is such that surface contrasts are used to advantage. The salt water is taken into the gathering lines at the lease gunbarrel tanks.

The Tomball field produces oil from a thin sand section found at about 5500 feet. The salt water, however, is not being returned to the producing zone. Humble Oil & Refining Company has completed all its injection wells at about 3800 feet, in a sand ideally suited to disposal purposes. Other good sands were found between 3200 and 3800 feet, providing a disposal reserve that may prove useful in future injection operations.

The injection wells are drilled and completed as simply as possible. After drilling a 13-inch hole to 1000 feet, a string of 9⅝-inch casing is cemented as a protective measure. An 8⅝-inch hole is drilled to bottom at about 3800 feet, and 5½-inch casing cemented through the injection zone. The casing is then perforated opposite the sand with about 100 shots, and injection is through the perforations. Tubing, with packer on bottom, was run in the first injection well, but the two wells more recently completed carry only the 5½-inch casing strings. Injection through these larger conductors has been as satisfactory as through tubing. The casing will be tested occasionally for leaks, and should any develop tubing and packer will be run to a point below the leaks.

Injection in all wells is by gravity or natural head. When the rate of flow into the injection sand is reduced, a horizontal duplex pump is placed on the well line and the original rate usually is established in a short time.

Treatment of the water ahead of injection has not been necessary. Tomball salt water contains only 1 part per million of iron, and from 35 to 40 parts of calcium per million. Care is taken to keep the water from contact with iron prior to actual injection, use of composition pipe in the gathering system being a large part of this effort. It is necessary to use steel pipe between the pump and the wellhead, since a considerable pressure is built up during the short pumping periods.

Two injection wells now are handling about 3000 barrels of salt water daily, with a third well being connected to the system. A much greater amount could be handled. It is believed that one well will be able to handle up to 5000 barrels daily under gravity flow, but full tests have not been made. The first well was completed a year ago and has taken around 350,000 barrels of salt water. The second well was completed three months ago and since that time has been taking its full part of the total. The third well was completed recently and is being added to the system.

Evaporation in this area is very low and annual loss to the air from the pits is negligible. Lining the pits prevents loss through seepage and checks the growth of bacteria that might occur in unlined pits.

The flow of the salt water from the storage pit to the injection well is through a small concrete pit equipped with baffles and excelsior traps. Here oil particles and foreign matter are removed. No elaborate filters are required.

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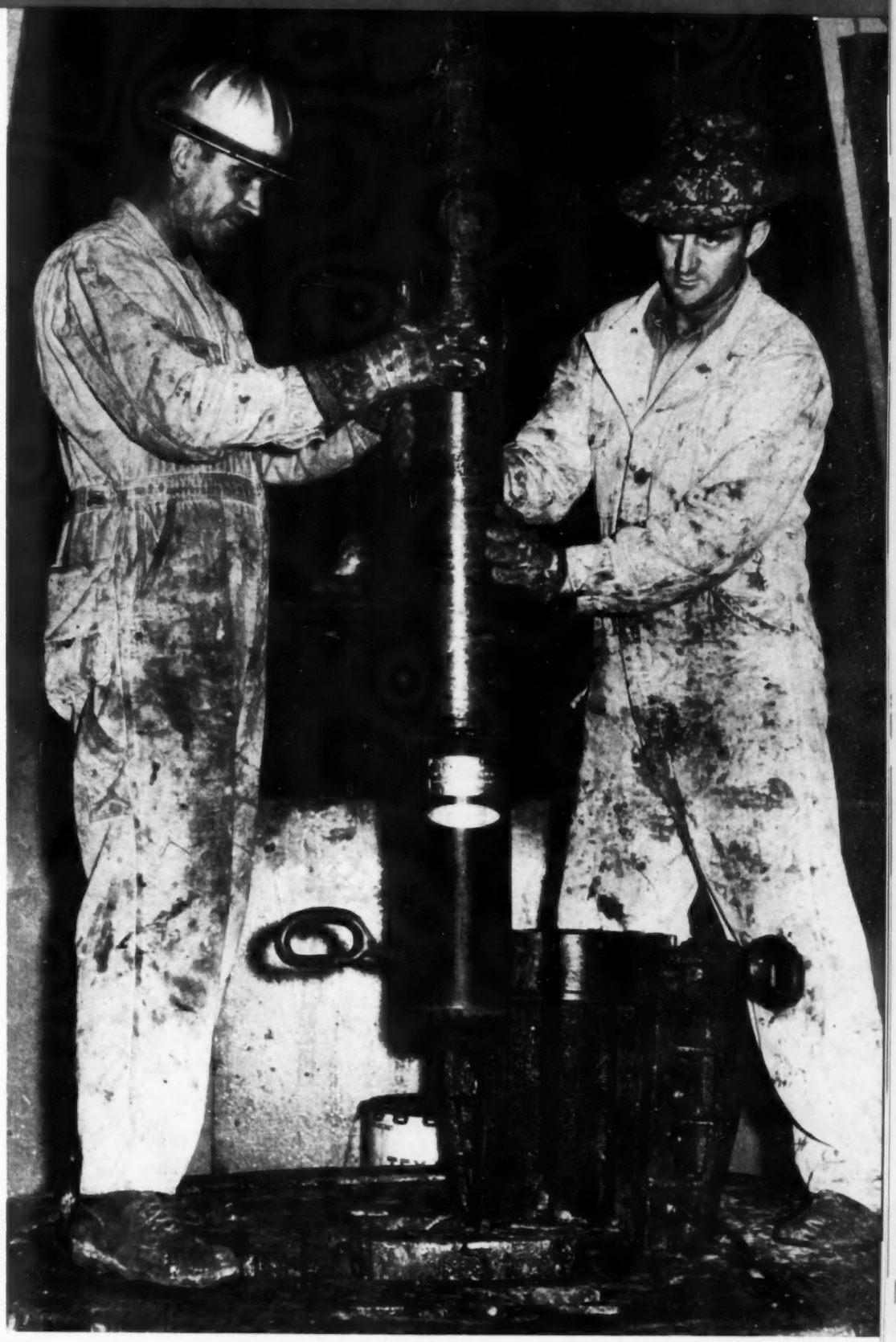

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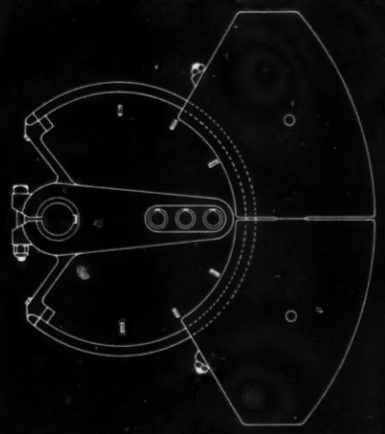

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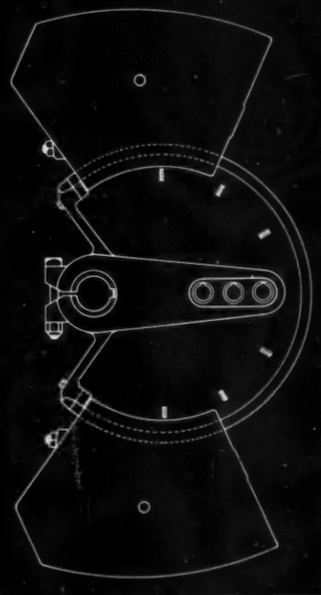

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# Economics of Controlling Water Produced With Oil

By J. U. TEAGUE, Hogg Oil Company

**THE economics of doing remedial work to exclude the water from wells producing water and oil is a problem of serious concern to the operator.**

**The production of water in some fields is, no doubt, injurious to the oil-producing reservoir, and should be excluded to conserve reservoir energy and increase ultimate recovery. In many other fields there is no apparent damage to the reservoir by the production of water, and any remedial work done must be justified by the saving in operating cost resulting from not having to lift the water and then dispose of it.**

**The principal factors which should be considered in determining the economics of remedial work are:**

1. **Physical characteristics of the reservoir.**
2. **Effect of water production on reservoir energy and ultimate recovery.**
3. **Means of determining the source of water.**
4. **Types of remedial work in common use.**
5. **Increased operating costs due to production of water with oil.**
6. **Disposal of water produced.**

**It is important that the statistical data and information necessary to evaluate these factors be accumulated prior to the time the production of water becomes acute and a decision on remedial work must be made.**

**Presented at a meeting of the Division of Production of the American Petroleum Institute, Chicago, November 14, 1940. The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute.**

THE purpose of this paper is to discuss the various factors which should be considered when deciding whether it is economical to perform remedial work to exclude the water from oil wells which are producing a percentage of water, and what statistical data and other information should be accumulated to evaluate these factors. The discussion will be as general as possible, as conditions will vary so much between fields, or even wells, that specific recommendations would be of little value.

The decision to perform remedial work on wells producing water with the oil is not arrived at easily if it is to be justified on a cost basis and, with the steadily declining allowable rates of production from each well, it becomes increasingly important that a satisfactory return on all major well expense or investment be assured before the work is commenced. This return may be in the form of lowered operating costs because of not having to lift the water in addition to the oil, or because of less tangible benefits such as conservation of reservoir energy and greater ultimate recovery of oil through the more efficient utilization of water encroachment.

The major considerations in deciding on a program of remedial work to exclude water from oil wells discussed in this paper are:

1. Physical characteristics of the reservoir.
2. Effect of water production on reservoir energy and ultimate recovery.
3. Means of determining the source of water.
4. Types of remedial work in common use.
5. Increased operating costs due to production of water with the oil.
6. Disposal of the water produced.

### Physical Characteristics of the Reservoir

The physical characteristics of the reservoir most easily are determined, at the time the wells are being drilled, by an analysis of the cores taken from the producing horizon supplemented by electrical-log information and possibly mud analyses. These characteristics are essential not only to the subsequent identification and control of water which might appear in the wells, but to the proper initial completion of wells. These characteristics are:

1. Gas-oil contact.
2. Water-oil contact.
3. Thickness of productive zone.
4. Effective porosity of the producing formation.
5. Stratigraphic variation in permeability of the producing formation.
6. Percentage of oil and connate-water saturation.
7. Amount of recoverable oil present in a unit volume of the producing formation.

From this information the well can be completed in such a manner as to give the longest productive life free of water. From this information also can be determined, to a large extent, the most effective remedial method to be used when water does appear, if it is desired to exclude the water.

As an example, a well completed in a reservoir which has a good horizontal permeability but a poor vertical permeability could be completed nearer the water-oil contact, without fear of the water coning upward and entering the well prematurely, than a well completed in a reservoir which had both a high vertical and horizontal permeability or no impermeable sections to retard the upward migration of oil and water. It probably would be desirable to complete the well having a high horizontal permeability and low vertical permeability near the water-oil contact to assure adequate drainage of the lower sections of the reservoir. When water appeared and conditions justified, the water could be shut off and the well recompleted as near the new water level as desired. Experience in the particular field, and close analysis of the information, would dictate how much formation could be closed off for the remedial work to give a maximum producing life free of water and a minimum of trapped non-recoverable oil. Generally

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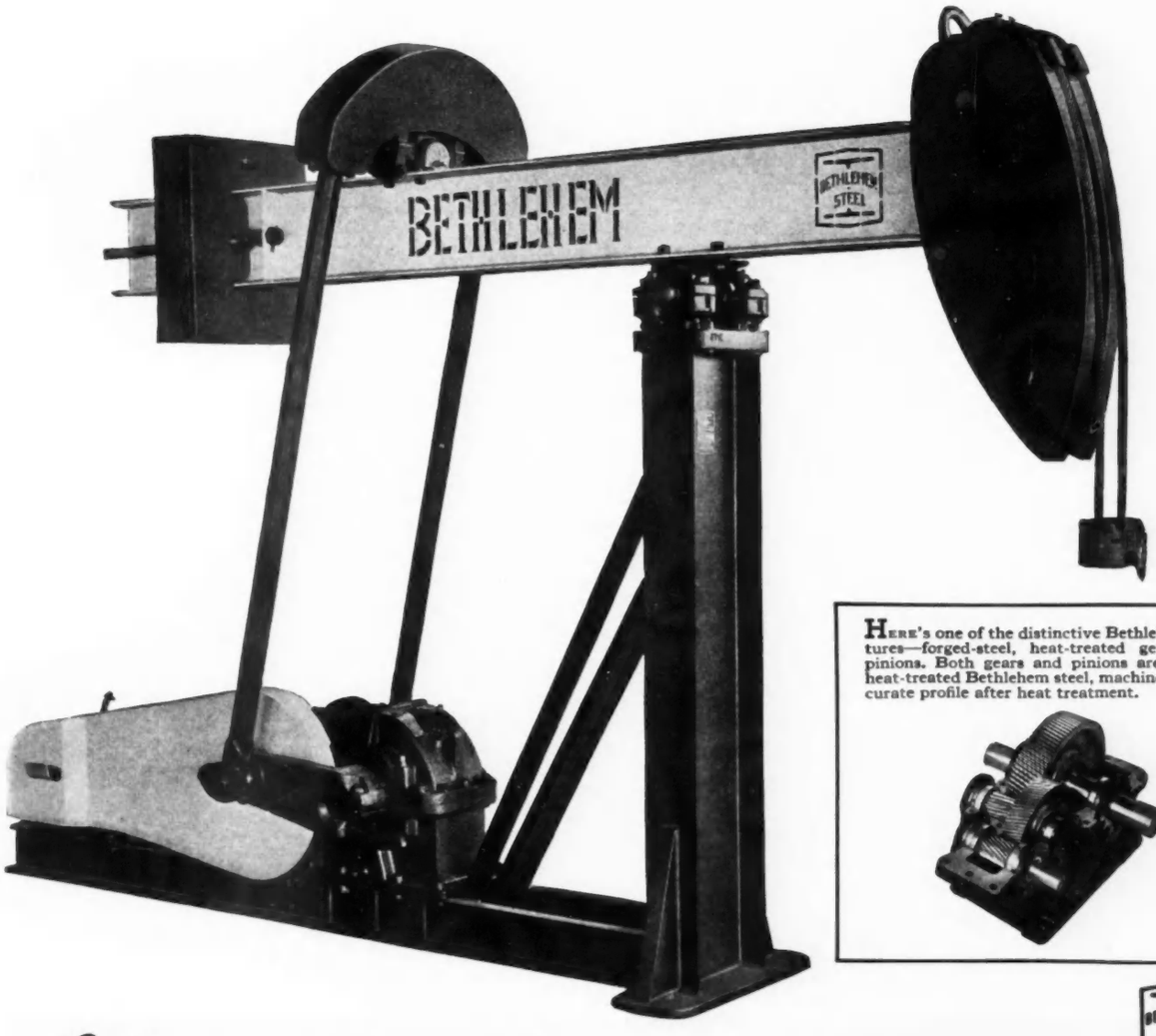


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speaking, a water shut-off can be obtained with much more assurance in a reservoir which contains impervious or highly impermeable lenses interbedded with the effective oil-producing section than in one which has a homogeneous producing section with a uniform vertical and horizontal permeability.

The foregoing example illustrates the important position occupied by certain types of information which can be obtained only during the drilling and completion of the wells, when determining the nature and extent of remedial work required in the future to obtain maximum performance from the reservoir.

Unfortunately most of the fields which now are producing large quantities of water with the oil, and which are of immediate concern, were developed prior to the time core analyses and electrical logging were in general use. Consequently, the data on the physical characteristics of the reservoirs are very meager, and will be of small help in dealing with the immediate problems. The importance of this information has been emphasized, however, to encourage the accumulation of basic data on the oil-producing reservoir, which data will be needed to analyze future production problems at the time such data most readily can be obtained.

### Effect of Water Production on Reservoir Energy and Ultimate Recovery

The effect of the production of water in quantity from a reservoir, together with the desired or, more aptly, the allowed production of oil on the reservoir energy, has been discussed at length by various authors. It has been pointed out by competent authorities on reservoir energy that the production of a barrel of water from the reservoir may have the same effect on reservoir energy as the production of a barrel of oil.[1]

The effect of the production of large quantities of water from some reservoirs which have a water drive to assist in the maintenance of bottom-hole pressure will be to accelerate the rate of decline of bottom-hole pressure to such an extent that a reasonable expenditure for remedial work to reduce the quantity of water produced would be justified to conserve the reservoir energy.

In other reservoirs the production of oil and water together will not exceed the rate of production at which the water drive can maintain the bottom-hole pressure at a satisfactory level, and there will be no apparent damage to the reservoir energy by the production of the water. In these fields a program of remedial work could not be justified on the basis of conservation of reservoir energy.

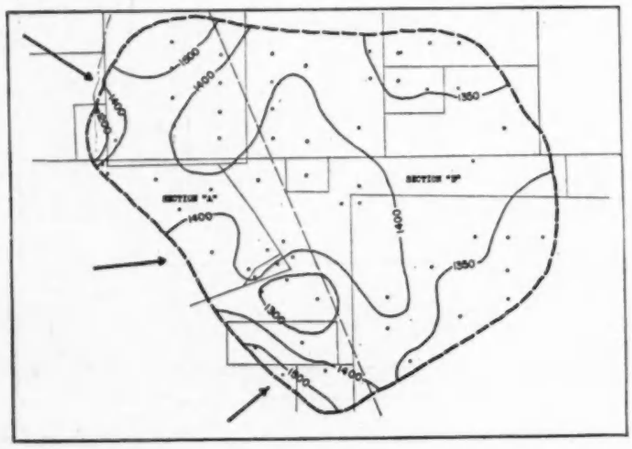


**FIGURE 1**
**Isobaric Map of Salt-Dome Field with Strong Water Drive from North and West.**

No doubt there are many fields producing substantial quantities of water with the oil which fall in each group. Many of the larger fields—particularly in the Texas Gulf Coast area, which are drilled on a wide-spacing pattern and which have very low allowable rates of daily oil production per well—will be able to produce comparatively high percentages of water without any detrimental effect on the reservoir energy, insofar as it can be determined by the decline in bottom-hole pressures.

It is desirable that bottom-hole-pressure surveys be made at frequent intervals to determine the effectiveness of the water drive, if it exists in a field, and its performance at different rates of production.

In addition to its function of maintaining reservoir energy, an active water drive properly controlled is of decided importance in increasing the ultimate recovery of oil from the reservoir.

Comparative data for secondary-recovery projects indicate that water flooding is from 200 to 400 percent more effective than gas repressuring. In fields which enjoy an active water drive, water flooding is accomplished by natural encroachment. If the same control is exercised over natural encroachment of water as would be exercised in intentional water flooding, then an increase in the ultimate recovery of oil can be expected.

The effective control of water encroachment must deal with the reservoir as a whole. A single property improperly operated may spoil the results of an otherwise ideally operated field. For example, Figure 1 is the isobaric map of a typical non-piercement-type salt-dome structure which has a strong water drive from the north and west, as indicated by the arrows. Assume this reservoir is able to maintain its bottom-hole pressure uniformly throughout at a certain rate of production. If the edge leases in section "A," which lie directly in the path of the water drive, are permitted to produce a large volume of water in addition to the allowable oil production, then the leases upstructure in section "B" will not receive the benefits of the normal water drive—thus resulting in decreased bottom-hole pressures and lower recovery of oil. If this field was in the pumping stage and depended on the water drive to maintain the fluid levels in the wells, the excessive water production in section "A" could be expected to result in lowered fluid levels with correspondingly greater lifting costs and probably lower ultimate recovery of oil in section "B."

In such cases it might prove justifiable to shut in completely the wells in section "A." If conditions warrant, the wells could be worked over to exclude the water, justifying the cost of the work by the increased efficiency of production and ultimate recovery of oil on the leases upstructure in section "B."

It is realized fully that such control over the operations of different leases in a field of diversified ownership is not always possible, but it is a goal to work toward if the greatest production efficiency and maximum recovery are to be realized. This goal can be reached only by closer cooperation between operators, unitization of fields, or by proper state regulating bodies.

It should be pointed out further that, although from a purely theoretical standpoint it might be

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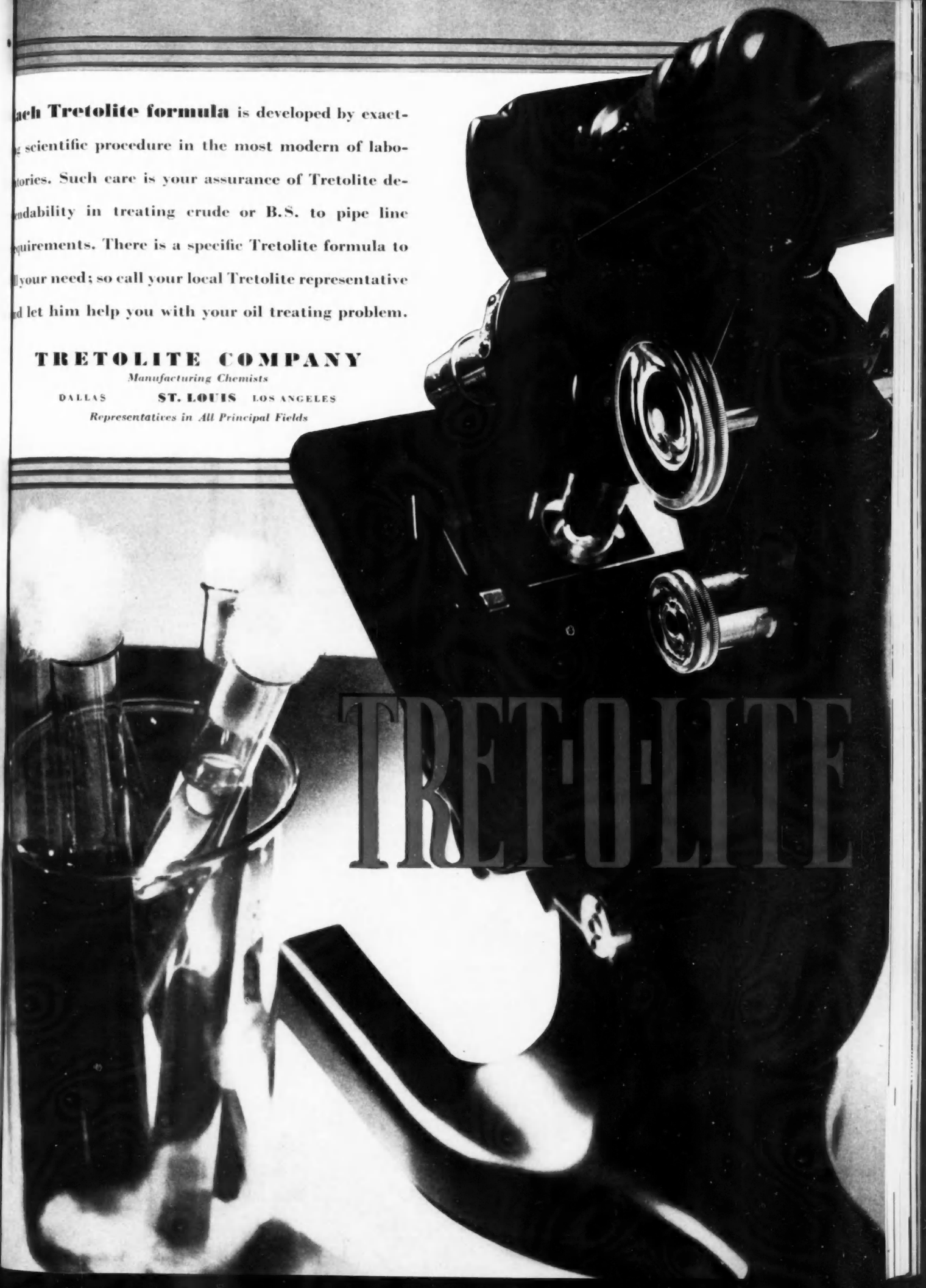

desirable in some cases to eliminate all water production in the interest of greater production efficiency, the beneficial results of such action must be weighed carefully against the cost. If a maximum degree of production efficiency is attained, but at a cost exceeding the probable return, then the primary object of making a resonable profit on the money invested has been defeated.

### Method of Determining the Source of Water

Determination of the source of water entering the well is a prerequisite to applying remedial control. The water produced by the well may be native to the producing formation, or may be the result of a faculty completion or mechanical defect in the well equipment which permits the water to enter the well from some formation above or below the producing zone. In a number of cases water occurs within the productive zone itself, especially when the productive zone is thick. Wells completed higher structurally, and much higher above the normal water-oil contact, often produce water before wells completed nearer the water-oil contact and lower structurally.

This can be attributed to the close proximity of a fault plane along which the water can travel into the well, or to selective encroachment of water through more permeable sections of the productive zone. The source of the water will determine to a large extent the remedial work which must be done.

There are a number of methods of determining the source of water, a few of which are:

1. Chemical analyses of the water.
2. Use of special water-locating instruments.
3. Calculation of the rise in the water-oil contact due to withdrawal of oil.
4. Plugging and testing.

The simplest and most apparent way of determining the source of water is by comparing the salinity of the water produced from the well with that previously determined from samples native to the producing zone. If the analyses of the water from the well differ greatly from that native to the producing zone, then a leak in the casing or a faulty cement job immediately can be suspected, and further tests can be made to determine the actual point of entry of the water into the well. This emphasizes the importance of the operator having samples of water obtained from different horizons analyzed as a future aid in identifying water produced by the well. This is particularly true of water obtained on drill-stem tests, when exploratory wells are being drilled.

A typical Gulf Coast well log, with the variation of analyses of water from the different horizons, is shown in Figure 2.

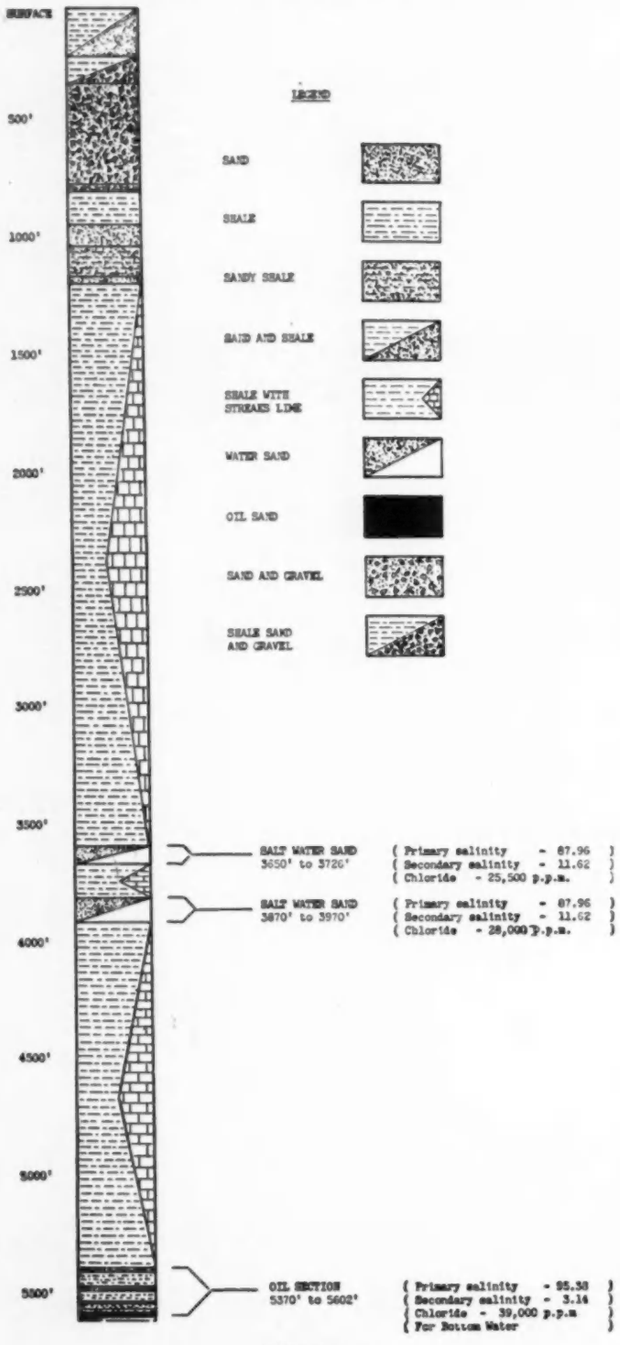


**FIGURE 2**
**Typical Gulf Coast Well Log Showing Analyses of Water from Different Horizons**

There are numerous devices being developed and available on the market—such as photoelectric cells, electrical logs, and electrical thermometers—that meet with varied success in locating the source of water entering the well bore. The results obtained from the use of these instruments are promising, and no doubt will come into more general use; but their description and the results obtained to date are beyond the scope of this paper. Detailed information on their operation and application can be obtained through the various companies offering the services.

If the appearance of water in the well indicates a rise of the water in the reservoir due to natural water encroachment replacing the producing oil, a check can be made by calculating the amount of oil withdrawn as compared with the original amount of producible oil estimated to be in place. To make this calculation, the information obtained from core analyses, together with the amount of oil produced by the well and the decline in bottom-hole pressure, must be available. If the calculation does not present a reasonable justification for the appearance of water from natural causes, then it is reasonable to assume that the water encroachment in the section is irregular, or that the water is from some extraneous source.

The most expensive, but at the same time probably the most reliable, method of determining the point of entry of water into the well is by a successive plug-

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**TABLE 1**
**Cost of Excluding Water from Wells in Conroe Field**

| Colum "A" Light Drilling Rig | | | Column "B" Well-Servicing Unit | | |
|---|---|---|---|---|---|
| Well | Cost | Results | Well | Cost | Results |
| A | $9,933 | Clear | G | $3,504 | Clear |
| B | 8,256 | Clear | H | 3,747 | Clear |
| C | 4,940 | Clear | I | 4,913 | Clear |
| D | 5,404 | Clear | J | 3,821 | Clear |
| E | 5,904 | Clear | K | 3,143 | Clear |
| 32 wells plugged by this method. Method: Pulled screen, placed cement plug, reset screen. | | | 6 wells plugged by this method. Method: Gun-perforated bottom of screen, squeezed with cement, gun-perforated screen above plug. | | |

ging and testing of the zone under question. This method is too well known to justify further description.

### Types of Remedial Work in Common Use

As has been stated, it is impractical to recommend any specific method for excluding water from a well which can be applied successfully to all conditions. Many different procedures are in current use, with good success. The method to be used will be governed by the manner of original completion and by local conditions. Probably the most popular method in use today is some form of "squeeze" cementing, which has proved highly effective in shutting off water irrespective of its point of entry into the well. Chemical plugging also is being widely investigated, and may prove effective in the future. However, the various methods of excluding water from wells in general use have been covered ably in previous publications of the American Petroleum Institute.[2]

Some operators have found that cheap and effective remedial work can be accomplished by doing a squeeze job using light well-servicing equipment. A comparison of the cost of this type of remedial work with other methods to exclude bottom water from wells in the Conroe Field is given in Table 1.

The jobs shown under column "A" were straight plug-backs which involved the use of a light drilling rig. These jobs were performed some five years ago. Under column "B" are recent "squeeze" jobs which did not require pulling screen and could be performed using ordinary well-servicing equipment. It is estimated that similar jobs can be done in the future in this field for as little as $2500 per well. As the technique of this work is improved, and if done in conjunction with well-servicing equipment employing a portable mast which will eliminate the erection, dismantling, and moving of a derrick, the cost of this work can be reduced still further.

The expected life of remedial work is a factor of greatest importance in considering a program involving a number of wells. This can be determined only by study of the local conditions in the field. If possible, trial remedial work should be done in advance of the time when water is expected to appear in a large number of wells, so that a proper decision can be made on a program involving large expenditures. In many cases trial work can be done in an edge well which produces, shortly after completion, large quantities of water.

**TABLE 2**
**History of Wells Plugged Back to Exclude Water —Conroe Field.**

| WELLS | SALT WATER | | | Top Plug Above Original Water-Oil Contact (Feet) | Months Since Work | Months Producing Water | Months Life of Work |
|---|---|---|---|---|---|---|---|
| | Before Work | After Work | At Present | | | | |
| | Percent | | | | | | |
| A | 17 | 0 | 3 | 29 | 76 | 49 | 27 |
| B | 16 | 0 | 0 | 61 | 63 | 0 | .. |
| C | 9 | 0 | 0 | 88 | 62 | 0 | .. |
| D | 38 | 0 | 17 | 43 | 62 | 20 | 42 |
| E | 31 | 0 | 0 | 89 | 62 | 0 | .. |

The performance of the remedial work done on the wells listed under column "A" of Table 1 is shown in Table 2.

Without some information as to the expected life of the remedial work, it would be difficult to determine whether the cost of the remedial work could be paid out by savings in operating costs.

### Increased Operating Costs Due to Production of Water

The production of water with oil results directly in increased investment and operating costs, apart from possible damage to the reservoir and decrease in ultimate recovery. Some of the items of operating cost affected by the production of water are:

1. Treating oil.
   a. Chemicals or electrical treating.
   b. Extra labor.
2. Pumping costs.
   a. Pumping power.
   b. Servicing power.
   c. Labor.
3. Salt-water disposal.
   a. Plant operation.
   b. Water treatment.
4. Corrosive action on equipment.

Items of investment which are involved in the production of water with oil are:

1. Pumping or artificial-lifting equipment.
2. Extra tankage.
   a. Gun barrels.
   b. Heaters.
3. Salt-water disposal plants.

The operating cost due to production of water in some instances can be reduced appreciably by a study of the problem. As an example, in fields where the bottom-hole pressure is high the cost of installing and operating pumping equipment can be deferred by the use of small flow strings. At low rates of production the velocity of flow in the conventional 2-inch and 2½-inch tubing may be too low to carry the water entering the well to the surface, and the water will accumulate gradually in the tubing until a sufficient head builds up to prevent natural flow. This may occur although there is sufficient reservoir energy and gas in the produced oil to maintain flow, if the velocity is sufficient to carry the water out of the well at the rate it enters.

By running a string of small tubing which will increase the velocity of the flow at a given rate of production high enough to carry the water out of the well, natural flow often can be maintained for an indefinite period.

There are records of wells which made as much as 90 percent salt water and which were taken off the pump, and these wells now are flowing naturally on 1¼-inch tubing.

The installation of small tubing is cheap, and the tubing is fully salvable; at the same time this defers the investment in pumping equipment and saves the extra operating expense of servicing the pumping well and furnishing power for pumping.

In many cases the cost of treating can be reduced

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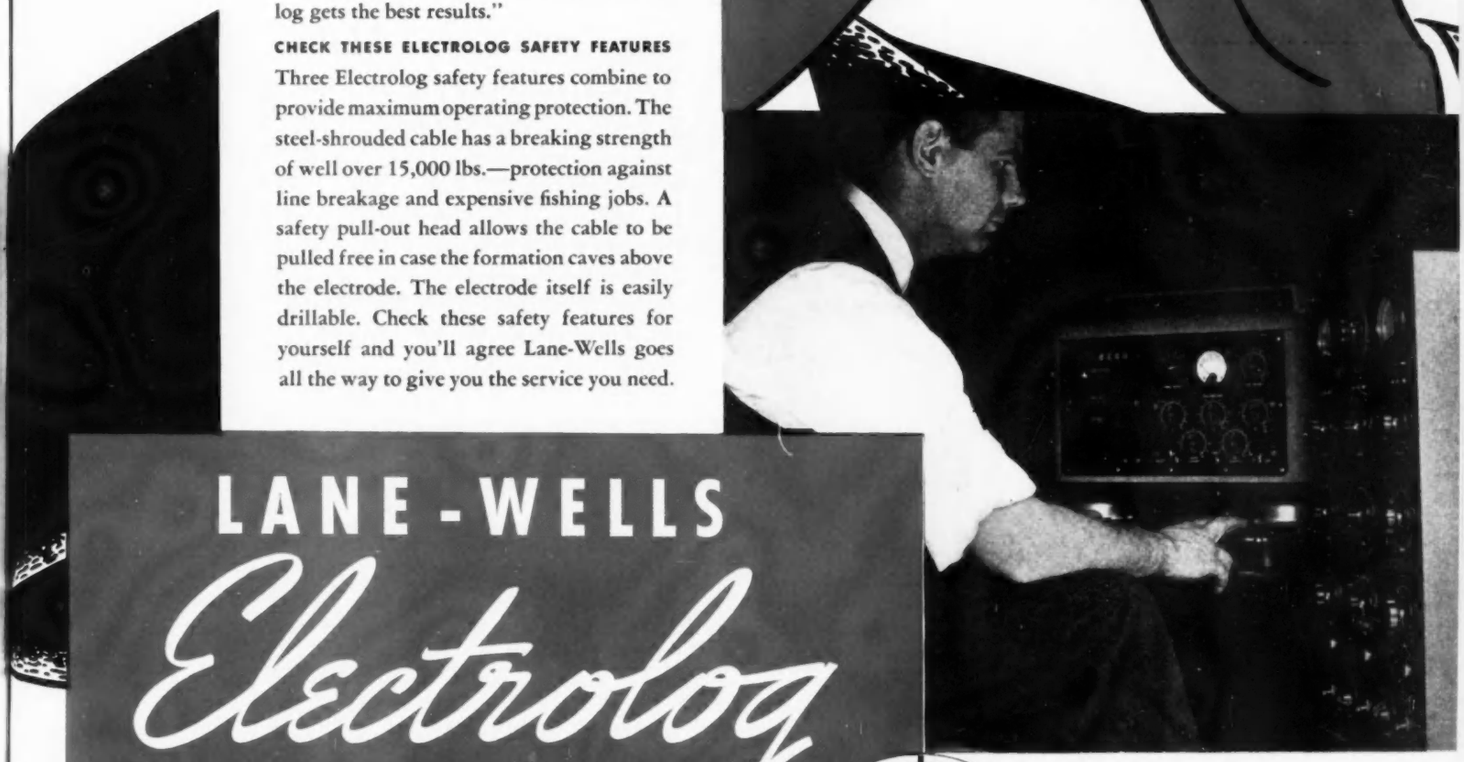

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**TABLE 3**

**Monthly Operating-Cost Summary of Four Salt-Water Disposal Systems in Louisiana**

Covering Period May 1939 through April 1940

| PERIOD | DISTRICT A | | | DISTRICT B | | | DISTRICT C | | | DISTRICT D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly Injection (Barrels) | Monthly Operating Cost | Cost Per Injected Barrel | Monthly Injection (Barrels) | Monthly Operating Cost | Cost Per Injected Barrel | Monthly Injection (Barrels) | Monthly Operating Cost | Cost Per Injected Barrel | Monthly Injection (Barrels) | Monthly Operating Cost | Cost Per Injected Barrel |
| May, 1939 | 316,275 | $2,910.35 | $0 009201 | 204,384 | $519.63 | $0.002542 | ..... | ..... | ..... | 37,240 | $125.83 | $0.003379 |
| June, 1939 | 322,430 | 1,256.00 | 0.003895 | 203,250 | 703.89 | 0.003463 | 71,532 | $4.26 | $0.000059 | 41,153 | 113.47 | 0.002757 |
| July, 1939 | 302,280 | 1,344.07 | 0.004446 | 171,496 | 1,047.44 | 0.006108 | 76,167 | 52.25 | 0.000686 | 50,500* | 1,200.00* | 0.023762* |
| August, 1939 | 195,205 | 1,256.39 | 0.006433 | 152,174 | 425.48 | 0.002796 | 62,531 | 84.45 | 0.001350 | 50,542 | 49.57 | 0.000981 |
| September, 1939 | 186,158 | 886.31 | 0.004761 | 175,191 | 914.72 | 0.005221 | 80,304 | 2.12 | 0.000022 | 54,831 | 17.54 | 0.000320 |
| October, 1939 | 133,682 | 882 09 | 0.006598 | 224,104 | 3,576.25 | 0.015957 | 94,639 | 33.90 | 0.000358 | 55,759 | 5.36 | 0.000096 |
| November, 1939 | 310,201 | 1,502.03 | 0.004842 | 292,501 | 970.46 | 0.003318 | 91,933 | 57.92 | 0.000629 | 61.613 | 164.48 | 0.002669 |
| December, 1939 | 318,695 | 1,708.82 | 0.005362 | 229,920 | 234.60 | 0.001019 | 115,025 | 163.86 | 0.001424 | 64,582 | 16.05 | 0.000248 |
| January, 1940 | 267,095 | 605.53 | 0.002267 | 188,998 | 389.72 | 0.002062 | 128,233 | 61.22 | 0.000477 | 65,415 | 37.03 | 0.000566 |
| February, 1940 | 216,603 | 1,085.01 | 0.005009 | 238,256 | 211.60 | 0.000888 | 124,961 | 168.27 | 0.001346 | 59,928 | 19.18 | 0.000320 |
| March, 1940 | 263,136 | 1,357.49 | 0.005159 | 244,943 | 230.51 | 0.000942 | 130,798 | 91.99 | 0.000662 | 60.854 | 42.64 | 0.000701 |
| April, 1940 | 252,235 | 991.92 | 0.003933 | 224,084 | 232.66 | 0.001034 | 145,036 | 93.50 | 0.000645 | 55,751 | 15.41 | 0.000276 |
| Total for 12 months | 3,084,075 | 15,786.01 | $0 061906 | 2,550,301 | $9,456.72 | $0.045350 | 1,129,164 | $813.83 | ..... | 658,168 | $1,806.56 | ..... |
| Averages | 257.006 | 1,315.50 | $0.005118 | 212,525 | 788.06 | $0.003708 | 102,651 | 67.82 | $0.000721 | 54,847 | $150.55 | $0.002745 |
| Plant gathering-system investment | $62,470.00 | | | $17,733.00 | | | $15,655.00 | | | No plant installation except 4x6 duplex pump. | | |
| Maximum capacity of plant disposal | 10,000 bbl. per day | | | 7,000 bbl. per day | | | | | | | | |

* Reperforated injection well No. 1.

greatly by a careful selection of the treating chemical which best will suit the oil produced, and by the use of efficient equipment to inject and mix the chemical into the oil.

Treating cost may be reduced further by the use of an inexpensive gun-barrel heater to maintain the emulsified oil at that temperature at which treatment to remove the water will be most effective. Proper temperature in many instances will eliminate entirely treating with chemicals.

The operating cost of producing a barrel of oil must be expected to increase even with the most efficient operations. The difference between the cost of producing a barrel of oil free of water and a barrel of oil with a quantity of water is the profit to be realized by performing remedial work to exclude the water. This difference in costs is essential to determine whether remedial work, as it affects operating costs, is justified. Therefore, accurate records of operating costs must be kept both before and after the production of water.

The cost records should be such that operating costs of individual wells can be determined as well as average lease costs.

## Salt-Water Disposal

One of the major factors to be considered in deciding on remedial work to control water production associated with oil is the method and cost of disposing of salt water. The methods of disposal in common use are:

1. Storage in open pits.
2. Periodic release into streams at flood stage.
3. Evaporation.
4. Underground injection.

The first three methods are more effective if the operator is located near enough to the coast to dispose of the water at or near tide water.

The most effective method of disposing of large quantities of salt water is by injection into subsurface salt-water sands when conditions will permit. In some of the Gulf Coast areas of Texas and Louisiana satisfactory rates of injection can be obtained with no more equipment than a pump and an abandoned well perforated opposite a known salt water sand. In many cases, after injection once has been started, the water will continue under a gravity head, handling up to several thousand barrels of water per day without the assistance of a pump.

In other cases, and particularly in the Mid-Continent area, the water must be filtered and in some instances treated to remove additional minerals before injection, to avoid plugging the sand face of the injection well.[3] These plants, if designed to handle large quantities of water, require a large investment; and it should be understood definitely that in some fields water cannot be disposed of successfully through input wells.

To determine the size and type of disposal plant which will be required for a particular field, complete information on the sub-surface zones suitable for injection and the nature of the water native to the zone as well as that to be injected must be available.

This information can be obtained by picking the most promising zones from electrical or drillers' logs of previous wells drilled in the field; then, as a new well is drilled, the different zones can be drill-stem tested to obtain samples of water for analysis. The bottom-hole-pressure chart obtained with the drill-stem test will give the bottom-hole pressure and some indication of the performance of the zone as an injection well.

It may be desirable and practical to dispose of the water through edge injection wells in the producing zone itself. This should serve the double purpose of water disposal and pressure maintenance.

The cost of installing and operating salt-water disposal plants in four fields in southern Louisiana is given in Table 3. The plants range from an elaborate installation for filtering, treating, and injecting 10,000 barrels per day to the simplest installation involving only an accumulation pit and injection pump.

## Outline of Records and Data Necessary for Analysis of Problem

Members of the Topical Committee on Production Practice have made numerous suggestions in their communications on the subject relative to the records and data which they consider essential for proper analysis of the economics of remedial work to exclude water. These suggestions are presented in outline form:

**I. Individual Well Data**

A. Geological data
   1. Driller's log
   2. Electrical log
   3. Top of producing zone

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4. Thickness of producing zone
5. Gas-oil contact
6. Water-oil contact
7. Core analyses
   a. Permeability of producing section
   b. Porosity of producing section
   c. Oil and connate-water saturation

(These data may not be necessary on every well, especially on inside wells drilled in a field whose sub-surface conditions are known.)

B. Completion data
1. Casing-seat depth
2. Amount and method of cementing oil string
3. Screen setting, if any, and formation screened
4. Gun perforations, if any, and formation perforated
5. Production packers, if any; type and depth set
6. Complete record of any special completion technique, such as use of acid, shooting, special chemical for removal of mud cake

(The first four items usually can be recorded graphically by diagram of the well setting.)

C. Production data
1. Initial production
   a. Gas-oil ratio
   b. Oil per day
   c. Casing and tubing pressure
   d. Method of production—natural flow, gas lift or pumping
2. Appearance of water
   a. Date of appearance
   b. Percentage of water produced
   c. Analysis of water
   d. Rate of increase in percentage of water
3. Cumulative oil and water production of well

(On large leases, when a number of wells are producing, the cumulative production will have to be approximated from individual well tests made periodically.)

4. Any expenditures on wells attributed to production of water
   a. Material
   b. Labor

D. Remedial work done to exclude water
1. Type of work done
2. Formation excluded above original water-oil contact
3. Results of work
4. Cost of remedial work
5. Date of reappearance of water

E. Operating cost
1. While well produced pipe-line oil
   a. Natural flow
   b. Gas lift
   c. Pumping
2. While well produced oil and water
   a. Natural flow
   b. Gas lift
   c. Pumping

(The operating cost on individual wells will have to be approximated on leases having a large number of producing wells, but should be reasonably accurate if care is exercised in making the estimate.)

## II. Reservoir Data

A. Geological
1. Type of structure
2. Average gas-oil contact
3. Average water-oil contact
4. Average thickness of productive formation
5. Average characteristics of productive zone
   a. Permeability, both horizontal and vertical
   b. Effective porosity
   c. Oil and connate-water saturation
6. Location of faults and other structural features

B. Reservoir energy
1. Type of drive
   a. Water drive
   b. Gas drive
   c. Both
2. Bottom-hole-pressure-decline curve
   a. Established by periodic pressure surveys on all wells or key wells
   b. Pressure information also can be presented by isobaric maps
3. Cumulative production curve
4. Cumulative water-production curve
5. Periodic water-production maps

(Wells producing water and percentages of water produced are shown on map to present both the rates of water encroachment and the distribution of water production.)

6. Gas in solution in the oil in the reservoir

(This information obtained from bottom-hole sample, and is needed in estimating recoverable oil.)

The curves **2, 3,** and **4** will determine the effect of the production of water on the bottom-hole pressures.

## III. Cost of Producing Water

A. Average lifting cost for lifting pipe-line oil
B. Average lifting cost for lifting oil and water
C. Investment costs to handle water
1. Artificial lifting equipment
2. Extra tankage
3. Other equipment

## IV. Salt-Water Disposal

A. Analysis of water from horizon adjacent to producing zone
B. Analysis of water from producing zone
C. Data on zones suitable for water injection.


### Acknowledgment

The Southwestern District Topical Committee on Production Practice desires to acknowledge the contributions from members of the topical committees on production practice in the other districts in the preparation of this paper, particularly from Messrs. E. K. Parks, California consulting engineer, and R. J. Sullivan, of The Carter Oil Company, Mattoon, Ill. Especial acknowledgment for their helpful criticisms is due to Messrs. M. B. Thomas, of Humble Oil and Refining Company; Harold Decker, of Seaboard Oil Company; Paul D. Torrey, of The Sloan and Zook Company; Ralph Schilthuis and L. W. Storms, of Humble Oil and Refining Company; and for their active assistance in the preparation of the paper to Messrs. Douglas Ragland and R. E. Bridges, both of Humble Oil and Refining Company.


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# Hydraulics of Mud-Circulating Systems

By WESLEY W. MOORE

MUD-LADEN fluid, as used in the drilling of wells by the rotary method, is called on to perform numerous functions. It serves primarily, however, as a vehicle for transporting drill cuttings from the bottom of the hole up to the surface, where they can be deposited. The desired characteristics of the mud, with reference to its physical and chemical properties, will be governed largely by the relative importance of the various purposes to be served at any one particular moment during a drilling operation. Although there may be what is considered an average mud, it cannot be stated accurately that there is a general-purpose mud, for the reason that characteristics most favorable for one condition may be least favorable for some other condition in the hole which occurs simultaneously.

Mud control, therefore, which represents in its broader aspect a logical compromise under such varying conditions, is entirely beyond the scope of this paper. This discussion relates rather to the means of efficiently circulating an average mud down to, and back up from, the bottom of the hole in volume adequate for effectively removing cuttings from the hole. Special reference is made to some of the factors to be considered in choosing the more favorable combinations of hole diameter, drill-pipe size, pump capacity, and prime-mover rating to be used in drilling a hole into which a given size and length of casing is to be set.

Whereas some of the principles involved in this discussion may apply generally, these analyses refer more particularly to conditions such as are found in the greater Mid-Continent area, where formations penetrated by the drill bit are generally firm and require the more or less continuous use of so-called rock bits. In the Mid-Continent area little or no importance can be attached to the jetting action of the high-velocity mud stream as an actual hole-making agent. Here also it is presumed generally that a rate of circulation which effectively elevates the drill cuttings will be adequate also for keeping both the bit and the bottom of the hole clean and free of debris.

Experience has taught that certain combinations of drill-pipe size, hole diameter, and rate of circulation are conducive to successful and economical drilling operations. Relatively high mean velocities in the returning mud stream appear to be an important factor in this connection and, although desirable, often are limited in application by friction head developed within the mud-circulating system—particularly within the drill pipe itself. Within practical limits, the friction head (or pressure drop) developed in any given mud-circulating system varies as the 1.85 power of the mean velocity of flow within the system, whereas the hydraulic-horsepower output of the slush pump, which maintains this circulation, varies as the 2.85 power of such velocity. In view of these relationships it is apparent that if the power requirements of the slush pump are to be kept within reason, and if the mean velocity of the returning mud stream also is to be kept at the desired higher rate, careful attention must be given to one important factor in the mud-circulating system, viz., the relation of the hole diameter to drill-pipe size.

**THIS discussion does not relate to mud control nor mud conditioning, about which much already has been published. It deals rather with a preliminary analysis of the problem of circulating an average rotary-drilling mud down to and back up from the bottom of the well bore in such volume and at such velocity as effectively to remove drill cuttings from the face of the formation being contacted by the drill bit and to transport such cuttings up to the surface, where they can be deposited.**

**The useful work accomplished by the circulating mud stream is normally very small in relation to the energy expended. Much of the hydraulic energy, furnished by the slush pump, is consumed by friction head within the drill pipe; whereas no useful work is accomplished by the mud stream until after it has left the drill bit. In most instances the overall mechanical efficiency of the mud-circulating system can be improved by closer attention to the relationship of hole diameter, drill-pipe size, and slush-pump capacity. Included with this paper are charts and tables which it is believed may assist in analyzing the problem which here is introduced.**

**Presented at a meeting of the Division of Production of the American Petroleum Institute, Chicago, November 14, 1940.**

**The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute.**

### Trend in Casing Size

The rotary method of drilling first was introduced successfully into the Mid-Continent area during the development of the Seminole field, about 15 years ago. It was the practice at that time to drill to a depth of 4200 feet, using a 6⅝-inch drill pipe with an 11-inch bit, and then to set 8⅝-inch casing. Slush

pumps capable of delivering approximately 600 gallons per minute soon came into general use. The inherent advantages of this program were such that mean velocities of returns could be maintained at about 200 feet per minute with only moderate pump pressure.

In more recent years, due to economic conditions generally and due to continued search for new oil reserves at greater depths, the trend has been toward smaller sizes of casing for the production string. During the past two years, preference for 5½-inch casing has made rapid gains over the still popular 7-inch size. Some operators prefer 6-inch over 5½-inch casing, whereas some others use as small as 4½-inch casing in certain areas. As yet we have not had sufficient experience drilling holes into which to set these smaller sizes of casing to show conclusively the most economical drilling program. Obviously the minimum size of hole for consideration is one that provides adequate clearance for running, circulating, and cementing the casing. The exact amount of clearance considered safe will vary with local conditions, and to some extent with the depth of hole to be cased. However, it does not follow necessarily that such minimum hole size, thus determined, is likewise the most economical size to drill, unless by chance it affords also the possibility of using safely, and with sufficient clearance for fishing, some standard size of drill pipe large enough to permit circulation of sufficient mud at moderate pressures to produce the desired mean velocity of returns in the annulus.

### Factors Involved

The useful work accomplished by the circulating mud stream is normally very small in relation to the energy expended. Much of the hydraulic energy supplied by the slush pump is consumed by friction head in the flow of mud down through the drill pipe, whereas no useful work is accomplished by the mud stream until after it first has left the bit. The mechanical efficiency of the system is accordingly very low and, therefore, presents an interesting field for study. The charts herein may assist in an analysis of the various factors involved, but no final and complete answer to the problem is attempted here.

The several charts designated Figures 1, 2, 3 and 5 result from simple mathematical deductions, whereas the chart designated Figure 4 is empirical in form and only tentative as to values shown therein.

Figure 1 illustrates graphically some basic comparisons between cross-sectional areas inside standard sizes of drill pipe, and the annular area outside the pipe when employed in drilling holes of various diameters. For the sake of convenience each such area is expressed in percent of total cross-sectional area of the entire hole, less that occupied by the material in the pipe. It is rather obvious that the higher the percentage of area inside the drill pipe, the more favorable such combination.

Figure 2 shows essentially the same fundamental relationships as are shown in Figure 1, except that in Figure 2 the resulting mud-stream velocity inside the drill pipe is compared directly with that in the annulus. Inasmuch as the primary function of the circulating mud stream—viz., removal of cuttings from the well—is performed in the annulus, and as relatively high velocities are desirable in attaining this result, the velocity ratio as shown must be kept low in order to prevent limitation of circulation through excessive pressure drop in pumping down through the drill pipe.

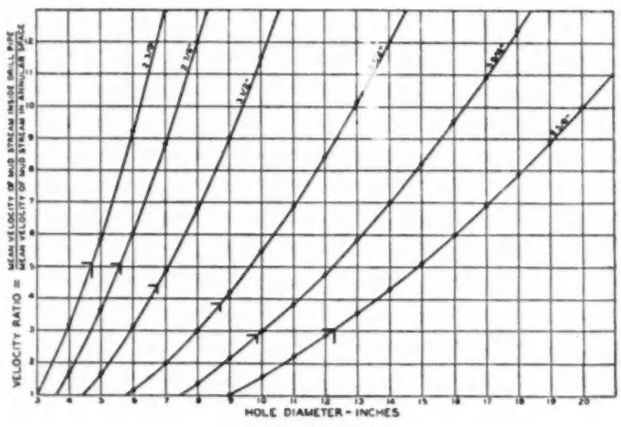


**FIGURE 2**
**Mud-Stream Velocity Ratios for Several Drill-Pipe Sizes in Holes of Various Diameters**

Figure 3 shows, for a large number of possible combinations of drill-pipe size and hole diameter, the

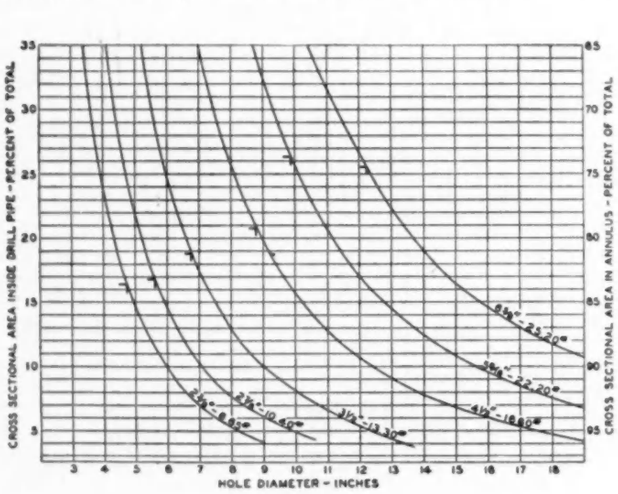
CROSS SECTIONAL AREA INSIDE DRILL PIPE - PERCENT OF TOTAL
CROSS SECTIONAL AREA IN ANNULUS - PERCENT OF TOTAL
HOLE DIAMETER - INCHES

**FIGURE 1**
**Relative Areas—Several Drill-Pipe Sizes in Holes of Various Diameters.**

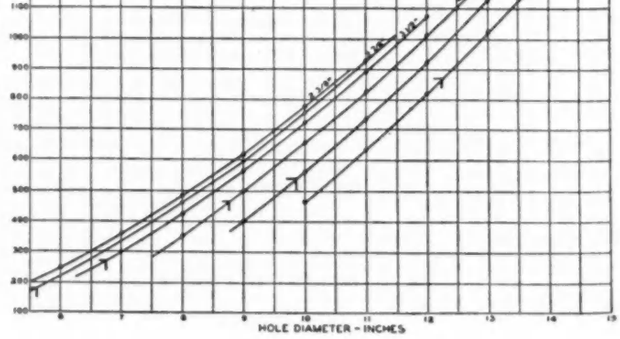


**FIGURE 3**
**Rate of Mud Circulation Required for Velocity of 200 Feet Per Minute in Annulus.**

## TABLE 1

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 8 Inch Stroke Liner Size (Inches) | (1¾ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 50 | 55 | 60 | 65 | 70 |
| 4 | 1.5742 | 79 | 87 | 94 | 102 | 110 |
| 4¼ | 1.7986 | 90 | 99 | 108 | 117 | 126 |
| 4½ | 2.0334 | 102 | 112 | 122 | 132 | 142 |
| 4¾ | 2.2882 | 114 | 126 | 137 | 148 | 160 |
| 5 | 2.5534 | 128 | 140 | 153 | 166 | 179 |
| 5¼ | 2.8322 | 142 | 156 | 170 | 184 | 198 |
| 5½ | 3.1246 | 156 | 172 | 188 | 204 | 219 |
| 5¾ | 3.4306 | 172 | 189 | 206 | 223 | 240 |
| 6 | 3.7502 | 187 | 206 | 225 | 244 | 262 |
| 6¼ | 4.0834 | 204 | 224 | 245 | 266 | 286 |
| 6½ | 4.4302 | 222 | 244 | 266 | 288 | 310 |
| 6¾ | 4.7906 | 240 | 263 | 289 | 312 | 335 |
| 7 | 5.1646 | 258 | 284 | 310 | 336 | 362 |
| 7¼ | 5.5522 | 278 | 305 | 333 | 361 | 389 |

## TABLE 2

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 10 Inch Stroke Liner Size (Inches) | (1¾ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 50 | 55 | 60 | 65 | 70 |
| 4 | 1.9677 | 98 | 108 | 118 | 128 | 138 |
| 4¼ | 2.2482 | 112 | 124 | 135 | 146 | 157 |
| 4½ | 2.5418 | 127 | 140 | 152 | 165 | 178 |
| 4¾ | 2.8602 | 143 | 157 | 172 | 186 | 200 |
| 5 | 3.1917 | 159 | 175 | 191 | 207 | 223 |
| 5¼ | 3.5402 | 177 | 195 | 212 | 230 | 248 |
| 5½ | 3.9058 | 195 | 215 | 234 | 254 | 274 |
| 5¾ | 4.2882 | 214 | 236 | 257 | 278 | 300 |
| 6 | 4.6877 | 234 | 258 | 281 | 304 | 328 |
| 6¼ | 5.1042 | 255 | 281 | 306 | 332 | 358 |
| 6½ | 5.5378 | 277 | 304 | 332 | 360 | 388 |
| 6¾ | 5.9882 | 300 | 330 | 360 | 390 | 420 |
| 7 | 6.4557 | 323 | 355 | 387 | 420 | 453 |
| 7¼ | 6.9402 | 347 | 382 | 416 | 451 | 485 |

## TABLE 3

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 12 Inch Stroke Liner Size (Inches) | (2 Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 45 | 50 | 55 | 60 | 65 |
| 4 | 2.3088 | 104 | 115 | 127 | 138 | 150 |
| 4¼ | 2.6214 | 118 | 131 | 144 | 157 | 170 |
| 4½ | 2.9737 | 134 | 149 | 163 | 178 | 193 |
| 4¾ | 3.3558 | 151 | 168 | 185 | 202 | 218 |
| 5 | 3.7536 | 169 | 188 | 207 | 226 | 244 |
| 5¼ | 4.1718 | 188 | 209 | 230 | 250 | 271 |
| 5½ | 4.6104 | 208 | 230 | 253 | 276 | 299 |
| 5¾ | 5.0694 | 228 | 253 | 279 | 304 | 329 |
| 6 | 5.5488 | 250 | 278 | 305 | 333 | 361 |
| 6¼ | 6.0486 | 272 | 302 | 332 | 363 | 393 |
| 6½ | 6.5688 | 296 | 328 | 361 | 394 | 427 |
| 6¾ | 7.1094 | 316 | 351 | 386 | 421 | 455 |
| 7 | 7.6704 | 345 | 383 | 422 | 460 | 498 |
| 7¼ | 8.2518 | 372 | 413 | 454 | 495 | 536 |

## TABLE 4

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 14 Inch Stroke Liner Size (Inches) | (2 Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 40 | 45 | 50 | 55 | 60 |
| 4 | 2.6936 | 108 | 121 | 135 | 148 | 162 |
| 4¼ | 3.0583 | 122 | 138 | 153 | 168 | 183 |
| 4½ | 3.4693 | 139 | 156 | 173 | 191 | 208 |
| 4¾ | 3.9151 | 157 | 176 | 196 | 215 | 235 |
| 5 | 4.3792 | 175 | 197 | 219 | 241 | 263 |
| 5¼ | 4.8671 | 195 | 219 | 243 | 268 | 292 |
| 5½ | 5.3788 | 215 | 242 | 269 | 296 | 322 |
| 5¾ | 5.9143 | 236 | 266 | 296 | 325 | 355 |
| 6 | 6.4736 | 258 | 291 | 324 | 356 | 388 |
| 6¼ | 7.0567 | 282 | 318 | 353 | 388 | 424 |
| 6½ | 7.6636 | 306 | 345 | 383 | 421 | 460 |
| 6¾ | 8.2943 | 332 | 373 | 415 | 456 | 498 |
| 7 | 8.9488 | 362 | 407 | 452 | 497 | 543 |
| 7¼ | 9.6271 | 386 | 434 | 481 | 529 | 577 |

## TABLE 5

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 15 Inch Stroke Liner Size (Inches) | (2¼ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 40 | 45 | 50 | 55 | 60 |
| 4½ | 3.6087 | 144 | 162 | 180 | 198 | 216 |
| 4¾ | 4.0864 | 163 | 184 | 204 | 225 | 245 |
| 5 | 4.5836 | 183 | 206 | 229 | 252 | 275 |
| 5¼ | 5.1064 | 204 | 230 | 255 | 280 | 306 |
| 5½ | 5.6546 | 226 | 254 | 283 | 311 | 339 |
| 5¾ | 6.2284 | 249 | 280 | 311 | 342 | 374 |
| 6 | 6.8276 | 273 | 307 | 341 | 375 | 409 |
| 6¼ | 7.4524 | 298 | 336 | 373 | 410 | 447 |
| 6½ | 8.1026 | 324 | 365 | 405 | 445 | 486 |
| 6¾ | 8.7784 | 351 | 395 | 439 | 483 | 526 |
| 7 | 9.4796 | 379 | 426 | 473 | 520 | 568 |
| 7¼ | 10.2064 | 409 | 460 | 510 | 561 | 613 |
| 7½ | 10.9586 | 438 | 493 | 548 | 603 | 658 |
| 7¾ | 11.7364 | 470 | 528 | 587 | 645 | 704 |

## TABLE 6

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 16 Inch Stroke Liner Size (Inches) | (2¼ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 40 | 45 | 50 | 55 | 60 |
| 4½ | 3.8493 | 154 | 173 | 193 | 212 | 231 |
| 4¾ | 4.3588 | 174 | 196 | 218 | 240 | 262 |
| 5 | 4.8892 | 195 | 220 | 244 | 268 | 293 |
| 5¼ | 5.4468 | 218 | 245 | 272 | 299 | 326 |
| 5½ | 6.0316 | 241 | 271 | 301 | 332 | 362 |
| 5¾ | 6.6436 | 265 | 298 | 332 | 365 | 398 |
| 6 | 7.2828 | 291 | 328 | 364 | 400 | 436 |
| 6¼ | 7.9492 | 318 | 358 | 398 | 437 | 476 |
| 6½ | 8.6428 | 346 | 389 | 432 | 475 | 518 |
| 6¾ | 9.3636 | 374 | 421 | 468 | 515 | 562 |
| 7 | 10.1116 | 404 | 455 | 505 | 555 | 606 |
| 7¼ | 10.8868 | 435 | 489 | 544 | 598 | 652 |
| 7½ | 11.6892 | 467 | 525 | 584 | 642 | 700 |
| 7¾ | 12.5188 | 500 | 563 | 626 | 688 | 751 |

## TABLE 7

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 18 Inch Stroke Liner Size (Inches) | (2½ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 40 | 45 | 50 | 55 | 60 |
| 4½ | 4.1851 | 167 | 188 | 209 | 230 | 251 |
| 4¾ | 4.7583 | 190 | 214 | 238 | 262 | 286 |
| 5 | 5.3550 | 214 | 241 | 268 | 294 | 321 |
| 5¼ | 5.9823 | 239 | 269 | 299 | 329 | 359 |
| 5½ | 6.6402 | 266 | 299 | 332 | 365 | 398 |
| 5¾ | 7.3287 | 294 | 330 | 367 | 404 | 440 |
| 6 | 8.0478 | 322 | 362 | 402 | 442 | 482 |
| 6¼ | 8.7975 | 352 | 396 | 440 | 484 | 528 |
| 6½ | 9.5778 | 382 | 430 | 478 | 526 | 575 |
| 6¾ | 10.3887 | 415 | 467 | 519 | 571 | 623 |
| 7 | 11.2302 | 449 | 505 | 561 | 618 | 674 |
| 7¼ | 12.1023 | 485 | 545 | 605 | 666 | 727 |
| 7½ | 13.0050 | 520 | 585 | 650 | 715 | 780 |
| 7¾ | 13.9383 | 558 | 627 | 697 | 766 | 836 |

## TABLE 8

### Displacement in Gallons Per Minute—Duplex Slush Pumps

| 20 Inch Stroke Liner Size (Inches) | (2½ Inch Piston Rod Deducted) Revolutions Per Minute | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 40 | 45 | 50 | 55 | 60 |
| 4½ | 4.6501 | 186 | 209 | 233 | 256 | 279 |
| 4¾ | 5.2870 | 211 | 238 | 264 | 291 | 317 |
| 5 | 5.9500 | 238 | 268 | 297 | 327 | 357 |
| 5¼ | 6.6470 | 266 | 299 | 332 | 365 | 399 |
| 5½ | 7.3780 | 295 | 332 | 369 | 406 | 443 |
| 5¾ | 8.1430 | 325 | 366 | 407 | 448 | 488 |
| 6 | 8.9420 | 357 | 402 | 447 | 492 | 537 |
| 6¼ | 9.7750 | 390 | 440 | 489 | 537 | 586 |
| 6½ | 10.6420 | 425 | 479 | 532 | 585 | 638 |
| 6¾ | 11.5430 | 462 | 520 | 577 | 635 | 692 |
| 7 | 12.4780 | 499 | 561 | 624 | 686 | 749 |
| 7¼ | 13.4470 | 538 | 605 | 672 | 739 | 806 |
| 7½ | 14.4500 | 577 | 650 | 722 | 795 | 867 |
| 7¾ | 15.4870 | 619 | 696 | 774 | 851 | 929 |

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# "SURFACE CONTROL" *means on the* NIXON GAS-LIFT SYSTEM

1. **You can unload the well through the series of flow valves set in the tubing.**

2. **Change producing rate by changing the frequency of the lift periods.**

3. **Move from one flow level to another to follow the level of flow down the well.**

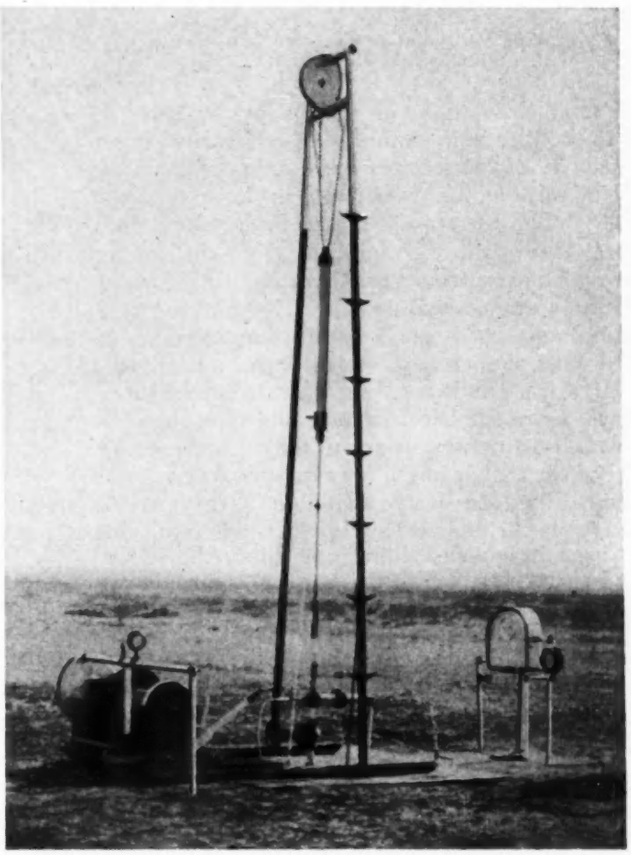
4. **Deplete a well with the original installation without changing or adding equipment.**

5. **Accurately control the amount of input gas used.**

Nixon Surface Control Gas-Lift System can be installed to flow wells from any depth in any volume, from off-bottom and in open hole; from the beginning of artificial flow through the stripper stage to depletion.

Hundreds of these Nixon Systems are now operating in fields throughout North and South America. In both deep and shallow wells they have set new low-cost standards of fluid-lifting.

If you want to reduce the cost of your fluid-lifting be sure you investigate the Nixon Surface Control Gas-Lift System. A Nixon Engineer can show you how to save money. Write your nearest Wilson Supply Company store or sales office and have an engineer visit you.



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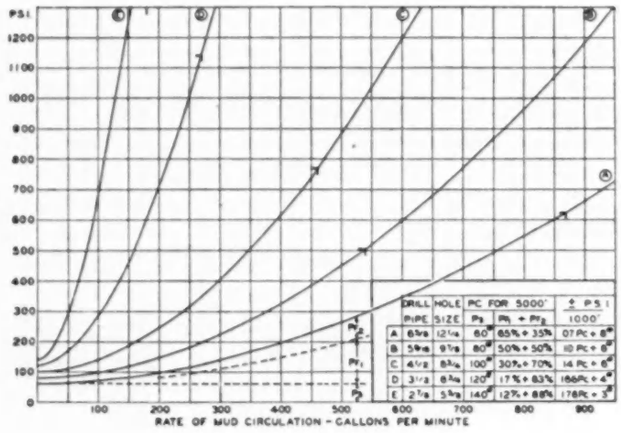

PSI
RATE OF MUD CIRCULATION - GALLONS PER MINUTE
DRILL PIPE
HOLE SIZE
PC FOR 5000'
± PSI 1000'
A 6⅝ 12¼ 60° 65% + 35% 07 Pc + 8
B 5½ 9⅞ 80° 50% + 50% 10 Pc + 8
C 4½ 8¾ 100° 30% + 70% 14 Pc + 8
D 3½ 6¾ 120° 17% + 83% 166 Pc + 4
E 2⅞ 5¾ 140° 12% + 88% 178 Pc + 3

**FIGURE 4**
**Approximate Circulating Pressure (PC) for 5000-Foot Depth.**

rate of mud circulation, in gallons per minute, required to produce in the annulus an arbitrarily chosen mean velocity of 200 feet per minute. It will be noted that relatively minor variations in hole diameter materially affect the required rate of mud circulation.

Figure 4 illustrates graphically the slush-pump pressures resulting from various rates of mud circulation at an assumed well depth of 5000 feet for the 5 most commonly used sizes of drill pipe, in combination with hole diameters in which perhaps they most commonly are employed. As stated hereinbefore, these curves are empirical in form and are subject to revision as to values, inasmuch as they represent conclusions of the author based only on observations and other such data as were available to him. It is believed, however, that for any given mud-circulating system used in a well-drilling operation, the resulting mud-circulating pressure may be broken down into three principal components: $P_s$, $P_{f1}$, and $P_{f2}$.

$P_s$, herein used to designate shearing pressure, is the pressure required to start the flow of drilling mud, which is not regarded as a perfect liquid, because a large proportion of solids is present. The shearing pressure varies directly as the well depth, but is apparently uninfluenced by variation in rates of circulation. The values, expressed in pounds per square inch per unit of well depth, are dependent on the physical properties of the mud and the nature of the combined flow channels. The values used in plotting curves shown in Figure 4 are those given by Herrick[1] for 70-pound mud.

$P_{f1}$—herein used to designate pressure drop resulting from fluid friction in fixed accessories such as mud lines, hose, swivel, kelly, drill collar and bit—is assumed to vary as the 1.85 power of velocity (or for any given circulating system, as the 1.85 power of the rate of circulation), but is otherwise constant, as these accessories do not change with well depth.

$P_{f2}$—herein used to designate pressure drop resulting from fluid friction within the drill pipe, through the tool-joint restrictions, and in the annulus—is assumed to vary as the 1.85 power of velocity (or rate of circulation as above), and also directly as the depth of the well.

The pounds-per-square-inch values shown for curves **A, B, C, D** and **E** in Figure 4, for various rates of circulation in an assumed 5000-foot well, are for total circulating pressure designated "$P_c$," wherein:

$$P_c = P_s + P_{f1} + P_{f2}.$$

Except for experiments performed by March and Gilbert,[2] there seems to be little published experimental data on which to base assignment of definite values to $P_{f1}$ and $P_{f2}$. It was necessary, therefore, to consider $P_{f1}$ and $P_{f2}$ collectively in plotting curves shown in Figure 4, with only a suggestive relative value for each, in order to facilitate derivation of a formula for estimating pressures at depths other than 5000 feet. In general, curves **A, B, C, D,** and **E** have been found to be representative, and reasonably accurate, when checked against a large number of recorded observations made available to the author.

Figure 5 shows graphically the hydraulic horsepower required of the slush pump to maintain mud

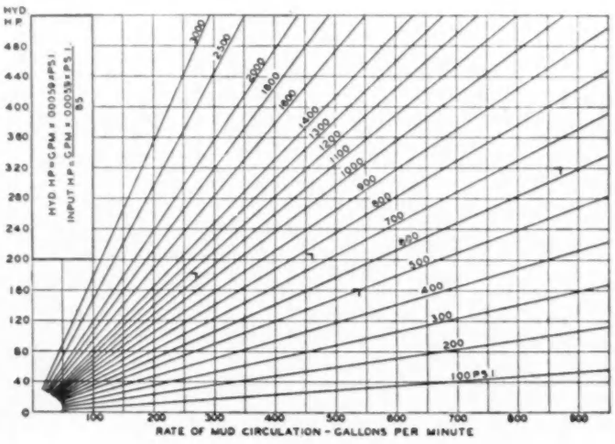



**FIGURE 5**
**Hydraulic Horsepower Required of Slush Pump.**

circulation at various rates and at various pressure differentials.

Tables 1 to 8 inclusive, show displacement, in gallons per minute, for slush pumps of different sizes operated at various speeds, and are included herewith for the reader's convenient reference. For actual deliveries, deduct 5 to 10 percent (depending on conditions) from figures in the tables.

## Conclusions

1. Results in practice, so far as they have been observed, seem to confirm the theoretical advantage of keeping the ratio of drill-pipe size to hole diameter as high as possible, and yet retain adequate clearance for fishing operations.

2. Drilling costs are influenced to some extent by the size, weight and initial cost of the drilling equipment required for a specific operation. More efficient use of slush-pump capacity, therefore, should result indirectly in lowered drilling costs.

3. The subject, here discussed qualitatively, would seem to be of sufficient importance to warrant further and more scientific study, so that a quantitative analysis of the various factors involved could be made available to the industry generally.

## Bibliography

[1] H. N. Herrick, "Flow of Drilling Mud," Trans. Am. Inst. Mining Met. Engrs. (Petroleum Development and Technology) **98,** 476 (1932).
[2] E. A. March and W. E. Gilbert, "Resistance of Mud through Regular No. Pull-H le Tool Joints," Drilling and Production Practice, American Petroleum Institute, New York, 34 (1935).

# DRILLING CONTRACTORS' NOTEBOOK

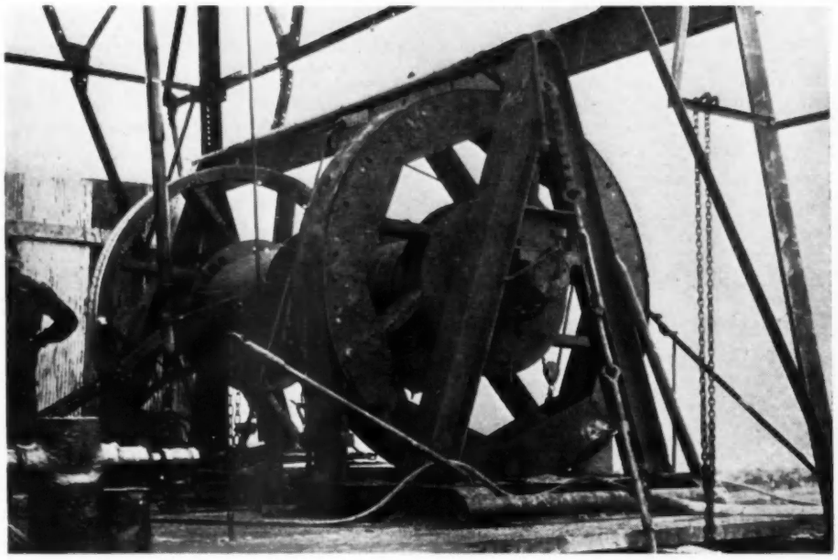
***Helpful Suggestions For Those Interested In Drilling Methods***

***Operating Ideas Maintenance Hints New Rig Hook-ups***

Published as a regular feature of THE OIL WEEKLY

## 1. TRANSPORTATION

### Unitization of Bull Wheel, Brake and Spools Facilitates Handling



**This unit, comprising all-steel bull wheel, brake, bull-rope throw-off and spools, facilitates handling and transporting the equipment from location to location.**

TIME is being saved by several drilling contractors in unitizing and making portable all possible drilling equipment. A western Kansas contractor has unitized his all-steel bullwheel, brake, bull-rope throw-off and spools.

Sturdy, all-welded channel-iron A-frames, cross member, and tapered ends of the skid base comprising the unit involve a slightly higher initial cost, give far more than the ordinary amount of service without repairs or replacements. Bearing journals are entirely enclosed and have a permanent, easily accessible lubrication system. Steel eyes welded to various points about the framework offer convenient means of attaching lines and turnbuckles in snubbing the unit firmly to the floor joists. The brake, mounted in the steel base, assures trouble-free service without being anchored in the floor.

As the unit is used primarily for drilling-in, a minimum of time is spent in loading the compact assembly, including the completely spooled lines, upon a truck and carrying it to the next location.

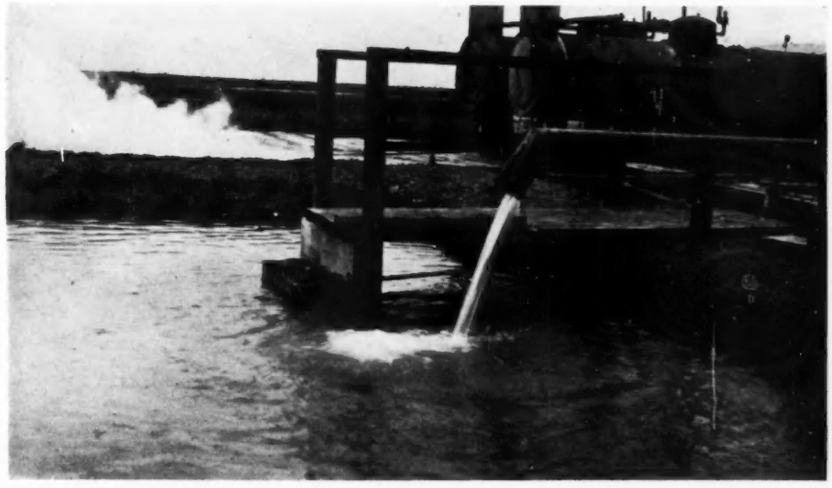
## 2. WATER SUPPLY

### Level Controlled By Simple Float

WHERE gas pressure is available, gas-lift flow of water for the boilers provides a simple and effective method of pumping the water well.

To eliminate manual control of this lift, one company installs a float valve in the fresh-water pit, extending the gas pressure line in a loop to the valve and setting the float level so as to close off the gas when a predetermined level has been attained.

Where positive shut-off is required, a snap-type valve may be substituted for the usual type of balanced valve, and a gas-flow cut-off before the volume dwindles to



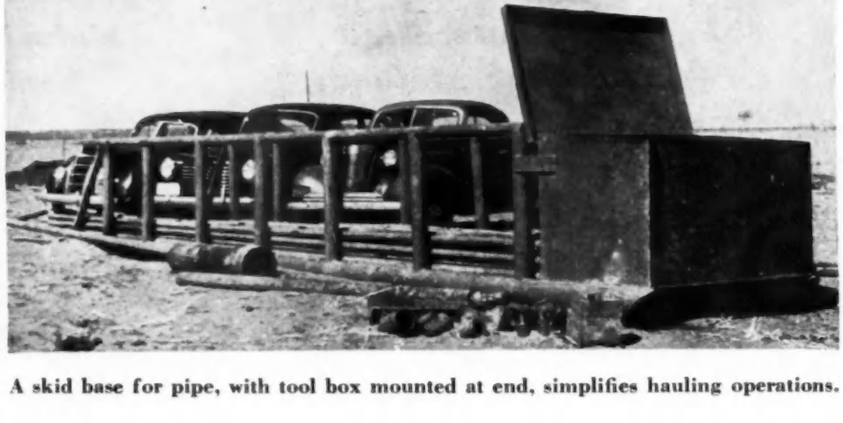
**Cut into the high-pressure gas flow line to water well, this regulator automatically blows well at low water and shuts down flow when upper level is reached.**

a value where it will not lift water against the hydraulic conditions existing in the well.

### 3. TRANSPORTATION

## Rack Eases Tool and Pipe Handling

FOR hauling pipe of various lengths and miscellaneous tools from one location to another, or across country to an isolated wildcat, Two States Drilling Company uses a rack with two long base sills of 6-inch pipe. Base sills have skid-type ends, cross-braced from one to the other. Several upright stakes for sides are connected by a top rail welded to the stakes. A metal box for small tools, fitted with a hinged cover, is mounted on one end of the rack. When moving to new location, the rack is winched onto a truck and the material loaded.



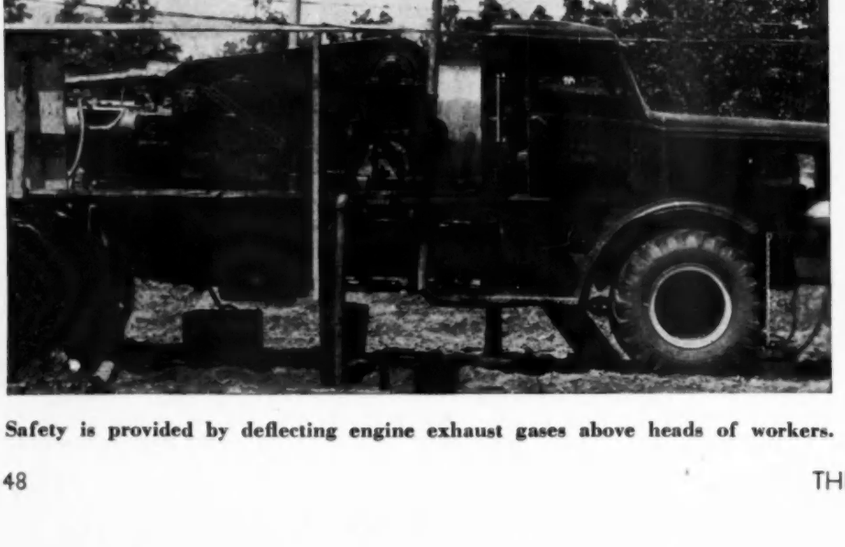
**A skid base for pipe, with tool box mounted at end, simplifies hauling operations.**

### 4. SAFETY

## Engine Exhaust Gases Deflected Upward

THE hazard to the drilling crew of a slim-hole rotary rig occasioned by exhaust gases of the drilling engine released beneath the truck was removed on a rig operating in the East Cromwell pool of Okfuskee County, Oklahoma, by adding a welded turn joint and 7 feet of pipe to deflect the exhaust gases above the heads of workers.

Exhaust gases of the truck engine are handled in a similar manner.



**Safety is provided by deflecting engine exhaust gases above heads of workers.**

### 5. MUD HANDLING

## Repairs to Standpipe May Be Localized

ONE of the points in the mud standpipe that receives considerable wear is opposite the point where the mud enters from the line leading from the mud pumps. Abrasive-laden mud striking the wall of the standpipe wears pits and grooves in the pipe and causes early replacement and repairs of an entire section of standpipe.

A California operator builds up his standpipes so that a flange union can be installed just above this point. A curved piece of steel representing approximately one-third the circumference of a section cut out of an old piece of 5-inch casing is tack-welded to the inside of the 6-inch standpipe opposite the point of impact of the inflowing mud stream. The section, 15 inches long, effectively cuts down replacement and installation costs, as it takes very little trouble, during periods of inactivity, to unbolt the union, pry loose the worn and pitted shield, and replace it with another.

The flange connection and mud line junction are placed easily accessible to the workmen.

**Flange union in the standpipe permits replacement of a shield that absorbs wear of abrasive-laden drilling mud.**

# HIGHLIGHTS IN THE WEEK'S NEWS

## Allowables

### *Texas Orders Survey of Crude and Gasoline Markets*

A survey of gasoline and crude markets to be presented at the state-wide hearing November 18 was ordered Friday by the Texas Railroad Commission. Commissioner Ernest O. Thompson said that telegrams were being sent to all purchasers asking them to have the data ready for presentation at that time.

Thompson explained that the purpose of the survey is to determine whether the operators need more oil than they are getting now. He also seeks an explanation of the precipitous decline in gasoline stocks during the past week. Purchasers are being requested to file full data showing comparative status of crude and gasoline stocks on October 1, 1939, and on the same date this year. They are also asked to advise the commission as to the amount of oil needed for working stocks at refineries, shipping terminals, and to fill pipe lines.

Similar information was obtained by the commission at a hearing held last March. Meanwhile, allowable increases for several fields has been granted since the last shutdown order was issued November 4.

Purchasers had already filed with the commission nominations for purchases during December, and estimates of their needs for the succeeding five months. The trend of these nominations was upward in about 45 percent of the fields available for checking. Apparently, this indicated a stronger demand for crude in December and thereafter than existed in November.

### *Texas Hints Increases to Meet Bureau Demand Figure*

Commissioner Ernest O. Thompson of the Texas Railroad Commission indicated last week that further allowable increases may be granted to bring the state's production up to the demand estimate of the United States Bureau of Mines.

Increases were granted last week including the Cayuga field, Anderson County, by exemption from shut-downs, to meet a demand for asphaltic crude by Pan American Pipe Line Company; to the Eureka Heights field, Harris County, to supply demand by Crown Central Petroleum Corporation; and to Midway field, San Patricio County, and Minnie Bock field, Nueces County, to prevent waste by water encroachment.

In the Cayuga-field order, the commission declared the oil was needed for construction of air fields at Pensacola, Florida, and for manufacturers supplying roofing material for use on Army cantonments.

"The Pan American Pipe Line Company has represented to the commission that they are under contract to such a large extent that if the Cayuga field is required to be shut in for seven days during the month of November, they will be materially damaged, and the national defense program will be greatly interferred with," the order stated.

Thompson, hinting at further increases, issued a statement which said, in part:

"The United States Bureau of Mines estimate for required Texas crude to meet the market demand each day in November is 1,291,000 barrels. During the week ending November 2, Texas produced an average of 1,239,000 barrels per day, which was 51,800 barrels per day under the bureau's estimate. In the week just ended, November 9, Texas produced 1,345,350 barrels per day, which was just about the same amount over the bureau as we were under the previous week.

"The average daily production for the past two weeks for Texas oil has been 1,292,275 barrels per day, which comes within 1200 barrels of the estimate. This is pretty close when it is considered that there are over 93,000 producing wells to prorate.

"The next two weeks will show Texas under the Bureau of Mines very considerably. There is no over-production of oil in Texas today. The market is firm. There is a strong demand.

"The nation, as a whole, produced 3,468,000 barrels per day the week ending November 2, against Bureau of Mines' estimate of 3,570,000. For week ending November 9, production was 3,584,675 barrels.

"The average daily United States total oil production for the two weeks ending November 9 was 3,526,637 barrels, which was 43,000 barrels average per day under the Bureau of Mines' estimate. Certainly this is not over-production in the nation as a whole."

### *Kansas Hearing*

A meeting of Kansas producers and purchasers to determine oil demand and establish the state December allowable has been scheduled for 2 p.m. November 29 at the Lassen Hotel, Wichita.

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## Control

### *Seek Legislation Linking California with Compact*

Enabling legislation to permit California to join the Interstate Oil Compact Commission is scheduled for introduction at the January regular session of the California legislature.

While California has usually been represented at compact meetings by an observer appointed by the governor, the state has so far failed to take an active part in the compact's activities.

Although remaining outside the compact, California has enacted many conservation measures required for active participation. The gas conservation law, well spacing regulations and other conservation statutes have been in effect for a number of years. An enabling act to place the state in the compact group would be primarily a formality.

An element in the California industry has been opposed to joining the compact in the past, and the opposition may reoccur in January. The national defense program and the oil industry's status under it must now contribute to consideration of the question, it is believed.

### *Texas Group Asks Separate Oil and Gas Commission*

The West-Central Texas Oil & Gas Association, through its executive committee, last week asked creation of a new commission to take over duties of the present Texas Railroad Commission in the regulation of oil and gas production.

The association, in a petition urging legislative action toward cure of present proration and production ills in Texas, asked that the new regulatory body be separate from the present railroad commission and be headed by appointive officers.

A bill providing for the new commission will be introduced early in the forthcoming session of the state legislature, according to Joe A. Clarke, association president. The proposal likely will call for a three-man body to serve for terms of six years, with two-year overlaps, he said.

Action of the traffic committee of the Texas State Manufacturers Association, at its annual meeting a week ago, in recommending a separate oil and gas commission on the grounds that the railroad commission of Texas is unable to devote sufficient time to freight-rate matters, was cited by Clarke as indicating the matter was of concern and import to groups and individuals not connected directly with the state's petroleum industry.

Dependency of the national defense program on conservation of the oil and gas of Texas, and necessity to allay demands for federal control of the petroleum industry, were given by Clarke as the major reasons for the action of the association in advocating a new conservation commission.

# World-Wide Developments

## *Rumanian Quake May Force Axis Drive to New Oil*

Serious damage by earthquakes to Rumania's oil-producing capacity last week may hasten the Axis' drive for crude reserves of Iraq, Iran and Bahrein Island. Lack of oil may force such a move.

Military censorship of news concerning the degree of damage to Rumanian producing wells obviously would minimize that angle of the havoc wrought by the quake. Radio comment early in the week, however, quoted Bucharest sources with saying that 50 percent of producing wells in the Ploesti area were damaged. Early dispatches said fires raged in the field; later ones said they were under control. Many producing wells developed fissures through which oil oozed and gushed out on the surface, a condition which could indicate a casing break, a cement plug dislodgement, or a damaging shift in the structural position of ordinarily impervious strata such as shale, or all three.

Oil thus discharged on the ground would be particularly vulnerable to any incendiary agent, whether its introduction were accidental or on purpose. News of the effect of the earthquake on gas lines and on wells making an appreciable amount of gas had not rated comment, but under normal field conditions it is to be presumed that the fire hazard in the fields would be about doubled by escaping gas.

Not only were Rumanian wells damaged, but storage depots, tank farms and refineries will have to be subjected to considerable rehabilitation if the country's industry is to be restored to its previous rank in international oil.

Campina, one of the country's main oil town located about 100 miles northwest of Bucharest, suffered heavily from shock and fire. Estimates of damage to producing and refining properties were not announced, but numerous fires were started and many stacks were toppled to the ground. Romano-Americana, a subsidiary of Standard Oil Company of New Jersey and one of the largest producing and refining organizations in Rumania, sustained heavy damage in the Campina area. Its refinery will be out of operation for at least two weeks. Steaua Oil Company offices were demolished.

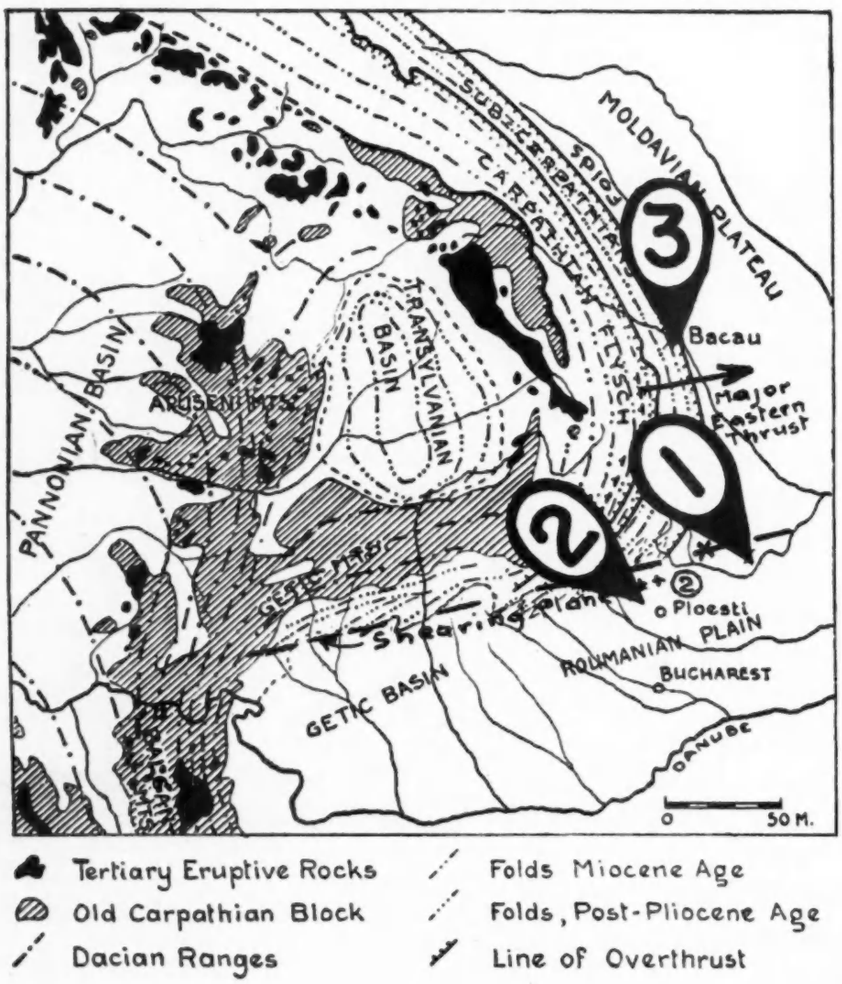
Giurgiu, one of the mail oil ports of the Danube, was severely damaged; 65 percent of the homes there were destroyed.

That the areas involved in a possible march to the east have been aware that such an act might take place was attested by discussion recently of formation of an Arab bloc to resist Axis aggression in the Near East. Cairo sources were quoted as saying Transjordan, Iraq and Saudi Arabia would be parties to such a bloc, with the support of Arabs in Palestine and Syria.

Iran and Iraq, both of which regard the oil industry as one of their main sources of revenue, and Afghanistan, where exploratory efforts were abandoned just prior to the war because of world conditions, already have a pact with Turkey providing for their assistance if Turkey is attacked.

Because England has recognized oil fields of the Near East as the objective of Italy and Germany in Mediterranean operations, England would give wholehearted support to formation of such a bloc.

**The map shows tectonic units of Rumania and adjoining areas, with 1 indicating earthquake epicenter; 2, Rumanian oil fields, and 3, town of Bacau, in ruins.**




### Blow to Axis

Importance of the earthquake to German military ambition is great. Rumania's annual production of 45,000,000 barrels was at the beck and call of Nazi units when the catastrophe occurred. It was looked upon by Germany as a means of sustaining mechanized military activity against England until the latter country could be crippled enough to offer no serious resistance to the German march to the east. Rumania's oil fields constitute the greatest immediately available source of supply for Germany, but even then, Rumanian oil was not enough for sustained war by the Axis.

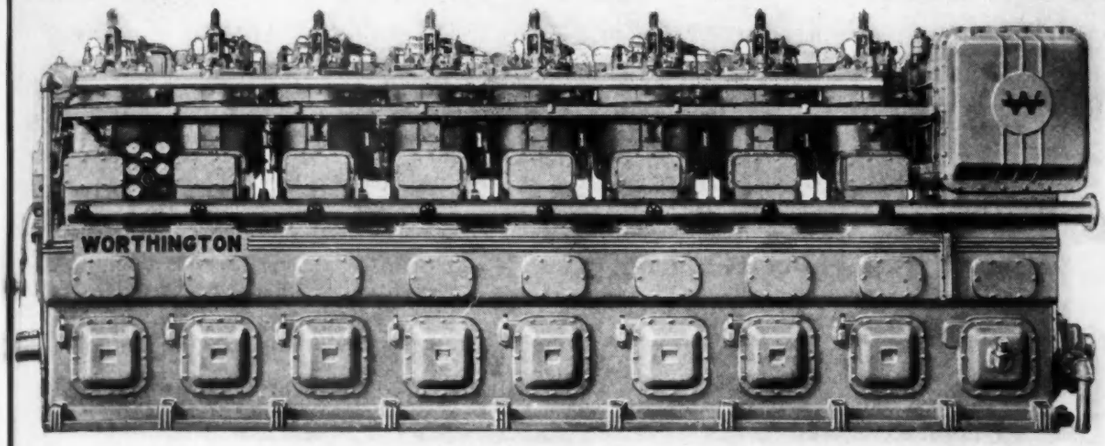
Italy and Germany have not been at any pains to conceal desire to control the fields of Iran, Iraq and Bahrein Island, a British protectorate. The current campaign in Greece generally is acknowledged in diplomatic quarters as a stepping stone to the conquest of the east and of the oil therein. Until the quake occurred, it is thought Germany felt it wise not to be in too great a hurry to attempt to march toward those fields through sympathetic Rumania and Bulgaria into either Turkey or Greece.

But Italy's slowness in finaling the Greek campaign, coupled with German uncertainty as to the exact extent of underground crude reservoir damage done by Rumanian earthquake, uncertainty as to whether Rumania long will continue the greatest individual source of crude supply (oil production will be drastically curtailed there for several weeks), all enhance the value of the Near East fields to the Axis partners.

Italy is known to be shy of petroleum requirements for prolonged war. Germany is presumed to be in the same boat to a more limited degree. Both must have more oil if the war is to be continued. Russian diplomatic conferences in Berlin during the week are not expected to result in shipment to Germany of any amount of oil that will curtail seriously performance of the difficult task of building up the Soviet's own reserves for her defense program. Hence, the early march to the east is indicated; that, or a loss of prestige in the eyes of the Balkans, or a winter of privation throughout continental Europe that conceivably could result in revolt against totalitarianism. Neither of these can the Axis afford. Gift of a breathing spell to England and pro-democracy circles would be poor military strategy for the Axis, it is felt.

So after all, if the damage to underground conditions in the Rumanian fields is as great as some observers think, it may be that the cause of attempting to shift

# HEAVY CONSTRUCTION THROUGHOUT...

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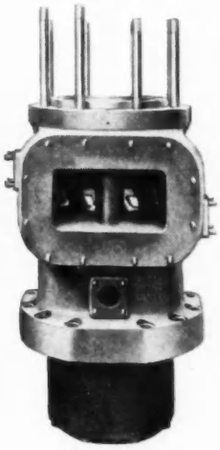
**IN engines built for mobile equipment, or where frequent changes of location are contemplated, light weight construction is essential. However, for stationary engines, designed for long life and continuous full load service, light weight is not desirable.**

**HEAVY CONSTRUCTION implies the placing of ample masses of metal *in correct structural relation,* to assure *strength, rigidity, maintained alignment, low wear, long life.* The result of all these factors is LOW-COST, TROUBLE-FREE OPERATION.**



Cylinder

Cylinder Liner

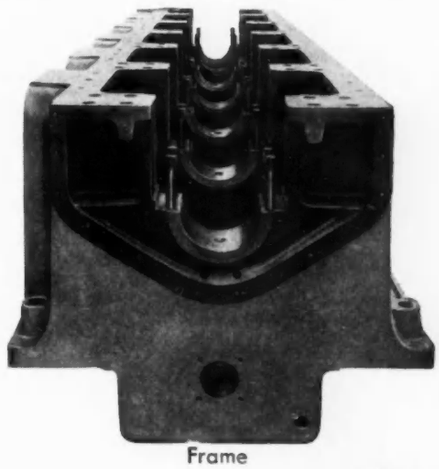
**THE FRAME, the "backbone" of the engine, is carefully designed. Thick walls and flanges, heavy ribbing, box sections, long bearing seats, large studs, deep oil sump —all contribute to strong, rigid construction.**

**THE CYLINDERS, with replaceable liners, are massive, individual castings—flanges are deep, studs are numerous and large.**

**THE CYLINDER LINERS are of alloy nickel iron, removable for jacket cleaning, and permitting low cost replacement. They bear on the cylinders at four points, and are double sealed against jacket leakage.**

**THE MAIN BEARINGS, with steel shells, are held rigidly in place by heavy cast caps and four studs as shown in the picture at the right, assuring permanent alignment and minimum shaft deflection.**

**THE SHAFT is of large diameter with heavy crank webs.**



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**COMPRESSOR CYLINDERS**—A wide selection of types and designs are available, in cast iron, cast steel or in steel forging as pressures may require. These follow the usual Worthington design as used on motor and steam driven compressors.

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●

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the brunt of fighting to the deserts and barren mountains of Iran, Iraq, and possibly Saudi Arabia and Bahrein Island, will be not that this army has succeeded here, nor that army has resisted too strongly there, but an earthquake.

Iran ranks fourth among world producers of crude oil. Fields of Iran, British-controlled, produced about 78,000,000 barrels in 1939, while Iraq fields produced 30,791 barrels.

## *Geologist Believes Quake Blow to Rumanian Oil*

Rumanian oil production has been dealt a severe blow by recent earthquakes and many wells will have to be re-worked, in the opinion of Dr. Ionel I. Gardescu, geologist and petroleum engineer, The Texas Company, expressed before the Houston Geological Society last week.

Gardescu, a native of Rumania and an authority on geology of the country, said it was not uncommon in Rumanian oil fields for casing to be broken off by shifting of the poorly consolidated sands.

"An earthquake of the magnitude of this one," Gardescu said, "would aggravate this condition and necessitate the re-completion of many wells. Some of the wells will be completely lost because water sands with pressures high compared to those in depleted oil sands, are above and below the producing formations. An increase in reservoir pressures is to be expected, but at the same time increased water production will result. Rumanian oil fields lie in a zone 40 to 50 miles north of Bucharest, close to the epicenter of the quake. In these fields the structural salt cores, instead of being round domes as in the Texas-Louisiana Gulf Coast, come as sharp wedges that have been squeezed through breaks in the crust of the earth. Any movement of the rocks in this area will affect the wells."

Gardescu said that east of the Carpathian mountains lies a series of over-thrust faults which are folds of older beds pushed over younger beds, of a type developed only where there is a major lateral force. The force in this instance was directed toward the east and had an origin which seismologists have calculated at 60 miles below the surface. At the lower end of the Eastern Carpathian Mountains is an area of intense faulting that marks the line along which the mountains have been pushed through geologic time. The oil fields of Rumania lie in this shattered zone, where effects of the quake were most felt.

Paul Weaver, Gulf Oil Corporation, remarked that reports of damage to surface equipment of the type used in Rumania was not necessarily a serious problem in maintaining production. He cited an earthquake in Mexico which increased production in the only field affected and caused flow outside the casing such as that described in accounts of the Rumanian quake, which stopped before the reservoir was impaired. Weaver also said the Long Beach earthquake of several years ago damaged nothing but surface equipment.

## *United States Takes 90 Percent of Mexico's Oil Export*

Mexico's best petroleum export customer continues to be the United States, having taken 1,626,845 barrels, or 90 percent, of the 1,854,908 barrels shipped out by Mexico in September.

Mexico's September export figures revealed a sharp increase in comparison with export figures for September, 1939, when 1,108,743 barrels were shipped, despite the fact that Mexico had not then lost the bulk of the Italian business. Petroleum exports of Mexico in August totaled 1,912,832 barrels.

The 10 percent of the September total not consigned to the United States went to: Japan, 145,984 barrels; Australia, 22,075 barrels (asphalt) and Cuba, 40,000 barrels of fuel oil.

## *Argentine Petroleum Consumption Increases*

Petroleum continues to furnish a larger and larger portion of Argentina's fuel consumption. Whereas in the period 1912-1914, petroleum accounted for but 5½ percent of the country's total quantity of fuel, during 1939 it constituted over 65 percent. A comparison of Argentina's fuel consumption of coal, petroleum and timber, expressed in percentage, follows:

| Period | Coal | Oil | Timber |
|---|---|---|---|
| 1912-14 | 80.8 | 5.5 | 13.7 |
| 1921-23 | 39.1 | 35.9 | 25.0 |
| 1930-32 | 36.1 | 57.0 | 6.9 |
| 1937-39 | 30.2 | 63.9 | 5.9 |
| 1939 | 29.4 | 65.8 | 4.8 |

The increased use of petroleum in all probability will continue, for the nation's domestic output of oil is being enlarged, and the country is dependent entirely upon importation of coal supplies and the latter has become more difficult due to the international war situation. Whereas petroleum had been imported to the extent of 90 percent of the nation's requirements prior to World War No. 1, during 1939 importations amounted to but 43.1 percent despite the vastly enlarged consumption of today as compared with 1914-1918.

Argentina's coal imports have come largely from England, with Germany, Poland, Holland, Chile and the United States furnishing smaller quantities. Naturally, imports of British coal have decreased materially, and imports have been disrupted entirely from Germany, Poland and Holland due to the European war.

Imports from Chile have come to a standstill as this country needs its available coal supply, and imports from the United States have been hampered by shortage of dollar-exchange. There is an improved prospect for coal imports from Brazil, although Brazilian coal is of a poor quality. Altogether, this situation has caused the country to turn more and more to petroleum as its source of fuel.

The increase of petroleum consumption as fuel has been conspicuous in Argentina's manufacturing industries, having risen from 2,420,420 tons in 1932 to 4,092,370 during 1939. Meanwhile, the country's domestic production of petroleum grew from 1,880,100 tons to 2,663,100 tons. Between 1936 and 1939, Argentina production of oil increased by 20 percent and industrial consumption of petroleum rose 25 percent; but between 1938 and 1939, production increased by 9 percent and consumption hardly 3 percent. If production continues to increase, petroleum imports may be reduced, or there may be an ample margin for expansion of industrial consumption.

An increase in Argentina production is dependent somewhat on an increase in the number of refineries. The new pipe line from the Tupungato district to the San Lorenzo refinery, to be built with the United States $20,000,000 credit from the Export-Import Bank, will alleviate the situation by speeding up transportation.

## *A.P.I. Officers . . .*

[*Continued from page 14*]

Atlantic Refining Company, Philadelphia; Henry M. Dawes, The Pure Oil Company, Chicago; W. S. Farish, Standard Oil Company of New Jersey, New York; Jake L. Hamon, Cox & Hamon, Dallas; J. C. Hunter, Mid-Continent Oil & Gas Association, Abilene, Texas; W. A. Jones, Cities Service Company, New York; F. A. Leovy, Gulf Oil Corporation, Pittsburgh; B. L. Majewski, Deep Rock Oil Corporation, Chicago; Frank Phillips, Phillips Petroleum Company, Bartlesville; Charles F. Roeser, Roeser & Pendleton, Fort Worth; W. S. S. Rodgers, The Texas Company, New York; E. G. Seubert, Standard Oil Company (Indiana), Chicago; H. F. Sinclair, Consolidated Oil Corporation, New York; W. G. Skelly, Skelly Oil Company, Tulsa; R. G. A. Van Der Woude, Shell Union Oil Company, New York, and William F. Humphrey, Tide Water Associated Oil Company, San Francisco.

Five members were added to the board of directors of the American Petroleum Institute. Fifty other directors were reelected. Those added to the board are C. L. Henderson, Vickers Petroleum Company, Wichita, to succeed L. B. Simmons, Rock Island Refining Company, Duncan, Oklahoma, in the central United States production group; W. L. Childs, Reed Roller Bit Company, Houston, to succeed E. S. Dublin, Byron Jackson Company, Los Angeles, and Percy C. Jones, The S. M. Jones Company, Toledo, to succeed A. E. Walker, The National Supply Company, Pittsburgh, as directors in the supply group; Ralph B. Lloyd, Lloyd Corporation, Los Angeles, to succeed Neal Anderson, Pilot Oil Company, Torrance, California; and Parker Melvin, Pennsylvania Grade Crude Oil Association, Bradford, to succeed W. Floyd Clinger, Warren.

The directors reelected the committee on membership, the personnel being D. E. Buchanan, Hanlon-Buchanan, Inc., Tulsa; R. A. Brommfield, Barnsdall Oil Company, Los Angeles; W. H. Ferguson, Continental Oil Company, Denver; C. P. McGaha, Fain & McGaha Oil Corporation, Wichita Falls, and Ralph Pryor, Pryor & Lockhart, Wichita.

### Division of Production

Members of the Institute's Division of Production elected 20 members to the division's 1941 general committee, and five additional members were appointed by the board of directors. Those elected were:

M. Albertson, Shell Oil Company, Houston; L. E. Barrows, The Texas Company, Houston; A. H. Bell, Continental Oil Company, Los Angeles; M. E. Brock, Gulf Oil Corporation, Houston; C. Bunje, Jr., The Illinois Pipe Line Company, Findlay, Ohio; C. P. Dimet, Phillips Petroleum Company, Bartlesville; M. J. Kirwan, Indian Territory Illuminating Oil Company, Bartlesville; C. V. Millikan, Amerada Petroleum Corporation, Tulsa; W. M. O'Connor, The Atlantic Refining Company, Philadelphia; B. E. Parsons, General Petroleum Corporation of California, Los Angeles;

Also, F. O. Prior, Stanolind Oil & Gas Company, Tulsa; D. T. Ring, Pres-

ton Oil Company, Columbus, Ohio; A. C. Rubel, Union Oil Company of California, Los Angeles; O. E. Schorp, The Carter Oil Company, Tulsa; D. R. Snow, Barnsdall Oil Company, Tulsa; R. C. Stoner, Standard Oil Company of California, San Francisco; John R. Suman, Humble Oil & Refining Company, Houston; Chase E. Sutton, The Pure Oil Company, Houston; A. W. Thompson, A. W. Thompson, Inc., Houston, and C. H. Kountz, Sinclair Refining Company, Independence, Kansas.

The following were appointed to the committee by the board of directors: L. L. Aubert, Bankline Oil Company, Los Angeles; E. DeGolyer, DeGolyer & McNaughton, Dallas; O. D. Donnell, The Ohio Oil Company, Findlay; John M. Lovejoy, Seaboard Oil Company of Delaware, New York, and J. Edgar Pew, Sun Oil Company, Philadelphia.

## Engineers Hear Papers on Reservoir Performance, Pipe-Line Service Life and Drilling Methods

PAPERS presented before the group sessions, Division of Production, covered a wide range of subjects now considered most important to production of oil under present conditions. The results of years of research were reflected in reports and papers on reservoir performance, pipe-line service life and drilling methods. Abstracts of most of the papers follow:

### Continuous Logging at Rotary-Drilling Wells

By J. T. Hayward
*Barnsdall Research Corporation, Tulsa*

The development of procedure and equipment now being used successfully in detecting relatively small quantities of oil, water and gas brought to the surface from the bottom of a drilling well by mud-circulating fluid used in rotary drilling, together with the method used in determining the depths of the horizons where samples entered the bore hole, were discussed.

The author described in detail a number of instruments placed upon a panel and installed in a trailer; the trailer being moved from location to location as the drilling rig is moved.

Most of the instruments are concerned with the logging of the well as drilling progresses. With these new instruments and methods, it now is possible to drill ahead continuously, and to know fairly accurately the type of formation that is being drilled, its oil, water, and gas content, and its depth.

Information of this nature, obtainable while drilling, is quite helpful, not only in determining completion procedures, but also may become useful in the later life of the well, in producing and reconditioning operations.

It was pointed out that although the collection of cuttings and the observation of the drilling rate do not interfere with the normal drilling operation, they do not furnish a complete log because they do not supply the information regarding the fluid and gas contents of the rocks encountered. It is for the fluid contents, rather than for the rock itself, that wells are drilled.

### Economics of Controlling Water Produced with Oil

By J. U. Teague
*Hogg Oil Company, Houston*

The economics of remedial work to exclude water from wells producing water and oil is a problem of serious concern to the operator. The production of water in some fields is, no doubt, injurious to the oil-producing reservoir, and should be excluded to conserve reservoir energy and increase ultimate recovery. In many other fields, there is no apparent damage to the reservoir by production of water, and any remedial work done must be justified by the saving in operating cost resulting from not having to lift the water and then dispose of it.

Principal factors that should be considered in determining the economics of remedial work are:

1. Physical characteristics of the reservoir;
2. Effect of water production on reservoir energy and ultimate recovery;
3. Means of determining the source of water;
4. Types of remedial work in common use;
5. Increased operating costs due to production of water with oil, and
6. Disposal of water produced.

It is important that the statistical data and information necessary to evaluate these factors be accumulated before producion of water becomes acute and a decision on remedial work must be made.

**AXTELL J. BYLES**
**Renamed A.P.I. President**

Some of the methods used for determining the source of water are:

1. Chemical analyses of the water;
2. Use of special water-locating instruments;
3. Calculation of the rise and fall in the water-oil contact due to withdrawal of oil, and
4. Plugging and testing.

### Oil Recovery by Air Drive in the Venango Fields of Pennsylvania

By Parke A. Dickey
*Pennsylvania Topographic and Geologic Survey, Harrisburg*
*and*
Robert B. Bossler
*Brundred Oil Corporation, Oil City, Pennsylvania*

The secondary recovery of oil by air drive has been practiced generally for approximately 15 years in the Venango oil fields, western Pennsylvania. Hitherto no attempt had been made to analyze the results and estimate the quantity of oil recoverable by this method.

The productive-decline curves of properties on which new development has taken place over a period of several years approximate straight lines on logarithmic paper. Following accepted procedure, the economic life and cumulative ultimate oil recovery of the properties thus may be predicted. Unfortunately, predictions could be made for only a few of the older properties and for none of the newer developments because, on most leases, new work so affected the oil production that no conclusions could be drawn. Twelve leases showed suitable curves. The estimates of cumulative ultimate recovery range from 11 to 100 barrels per acre-foot, with an average of 42 barrels. The economic life ranges from 9 to 48 years, with an average of 28 years.

Although a large number of factors affects the recovery of oil by air drive, it is believed the principal ones are the original oil and water content of the sand, the spacing of wells, and the efficiency of the application of air to the sand. The latter factor seriously is affected by the by-passing of air through the more permeable beds, and is difficult to take into account or evaluate.

It was suggested that ultimate oil recovery and well spacing are connected by an equation of the type:

$$y = ae^{-bxp}$$

Tentative values, based on available data, were assigned to the constants.

### Factors Affecting Reservoir Performance

By R. D. Wyckoff
*Gulf Research & Development Company, Pittsburgh*

Factors affecting reservoir performance were considered from a broad viewpoint and in conjunction with a review of general reservoir mechanics. The interrelation of these phases of the production problem thereby was stressed. Methods of determining such factors were included only when it was considered necessary to clarify discussion, and for this purpose only.

In the early days of the petroleum industry, and continuing until a few years ago, the engineer was concerned primarily with those problems accompanying the drilling and producing of wells and associated equipment. The limitation in scope was due not to any failure to recognize other phases of the production problem, but to conditions in the industry. Inasmuch as the wells are the important mechanical units through which oil must be withdrawn, the wells and their associated equipment were the bottle-

necks on the reservoir, and hence they, not the reservoir, were the targets for technical effort.

Any reservoir presents certain characteristics with which it was originally endowed, and over which we have very little or no control. Each of these has some influence over the reservoir performance, and some of these may so far overshadow all others as to dictate the technique of production. The type of reservoir becomes a matter for first consideration, and by "type" is meant details concerning structural characteristics, pay-zone characteristics and fluid content.

Core analysis, bottom-hole sampling and pressure measurements are factors affecting production performance of reservoirs. Factors affecting the exploitation program are location of wells in the reservoir, diameter of wells, and the function of wells. Reservoir mechanics chiefly involves water drive and gas drive. If well spacing is an important factor in reservoir performance beyond its influence in providing adequate control, it must involve an effect upon ultimate recovery.

### The Determination of Factors Affecting Reservoir Performance

By M. Muscat

*Gulf Research & Development Company, Pittsburgh*

A review is given of the various types of production engineering data which should be taken during the course of development of oil and gas reservoirs. These data are discussed from the point of view of their application to problems of reserve estimation, well completion, control of production performance, and secondary recovery operations.

The discussions give an idea of what types of engineering data should be taken in the course of development and depletion of an oil-bearing reservoir. The stress upon the functional point of view, that is, upon the applications of the data rather than the techniques of the measurements, has led to considerable repetition. This very repetition, however, will serve to emphasize the manifold uses to which the various types of data may be put. On the other hand, it is readily admitted that the treatment in many respects has been much more brief and cursory than the specific topics merit. Moreover, a number of questions pertinent to the control of well performance such as gas/oil ratios, water production, well location and general well treatment have not been discussed at all.

The paper is an elaboration of an answer the writer attempted to give recently to the question: What data should be taken in the development of an oil field to make possible its most effective exploitation? It is pointed out that future applications of the data are to be given as much weight as their immediate and present value. It is on the basis of this premise that considerations are presented.

### API Pipe-Coating Tests—Final Report

By Kirk H. Logan

*National Bureau of Standards, Washington*

In 1930, the American Petroleum Institute, with the cooperation of manufacturers of protective coatings and the National Bureau of Standards, undertook a study of protective coatings for pipe lines for the purpose of establishing the engineering principles involved in the design, selection and application of such coatings. The procedures for testing the coatings were agreed upon by the cooperating parties, and have been described in detail by Scott, who supervised the application of the coatings and reported the first three inspections.

The data on the conductance of the coatings lack uniformity. Not infrequently one section of a coating showed many times the conductance of another section of the same coating at the same test site. In many cases it is difficult or impossible to determine whether this lack of inconsistency is the result of lack of uniformity in the thickness or composition of the coating, poor application or non-uniform soil conditions. The same statements are applicable to maximum pit depths. The important fact is that the amount of protection afforded by many coatings was not uniform even under normally the same condition. Either the coatings as applied were not uniform or they lacked a sufficient factor of safety to provide against variations in the exposure to which they were subjected.

There was a general increase in the conductance of coatings over that observed in 1934. This indicates that the usefulness of the coatings is limited with respect to time, but there are individual exceptions to this generalization.

All of the coatings reduced the number of pits per unit area of surface, and most of the coated sections of pipe showed shallower maximum pit depths than occurred on the corresponding unprotected pipe. Several of the coatings afforded nearly complete protection to most of the pipe sections to which they were applied, but no coating completely protected all sections.

### Hydraulics of Mud-Circulating Systems

By Wesley W. Moore

*Tulsa*

This discussion does not relate to mud control nor mud conditioning, about which much already has been published. It deals rather with a preliminary analysis of the problems of circulating an average rotary-drilling mud down to and back up from the bottom of the well bore in such volume and at such velocity as effectively to remove drill cuttings from the face of the formation being contacted by the drill bit and to transport such cuttings up to the surface, where they can be deposited.

The useful work accomplished by the circulating mud stream is normally very small in relation to the energy expended. Much of the hydraulic energy, furnished by the slush pump, is consumed by friction head within the drill pipe; whereas no useful work is accomplished by the mud stream until after it has left the drill bit. In most instances, the over-all mechanical efficiency of the mud-circulating system can be improved by closer attention to the relationship of hole diameter, drill-pipe size, and slush pump capacity. Included with this paper are charts and tables which it is believed may assist in analyzing the problem introduced.

Results in practice, so far as they have been observed, seem to confirm the theoretical advantage of keeping the ratio of drill-pipe size to hole diameter as high as possible, and yet retain adequate clearance for fishing operations.

Drilling costs are influenced to an extent by the size, weight and initial cost of the drilling equipment required for a specific operation. More efficient use of slush-pump capacity, therefore, should result indirectly in lowered drilling costs.

**W. R. BOYD, JR.**
**Continues as Executive Head**

### Fluid-Meter Research at the University of Oklahoma

By W. H. Carson

*and*

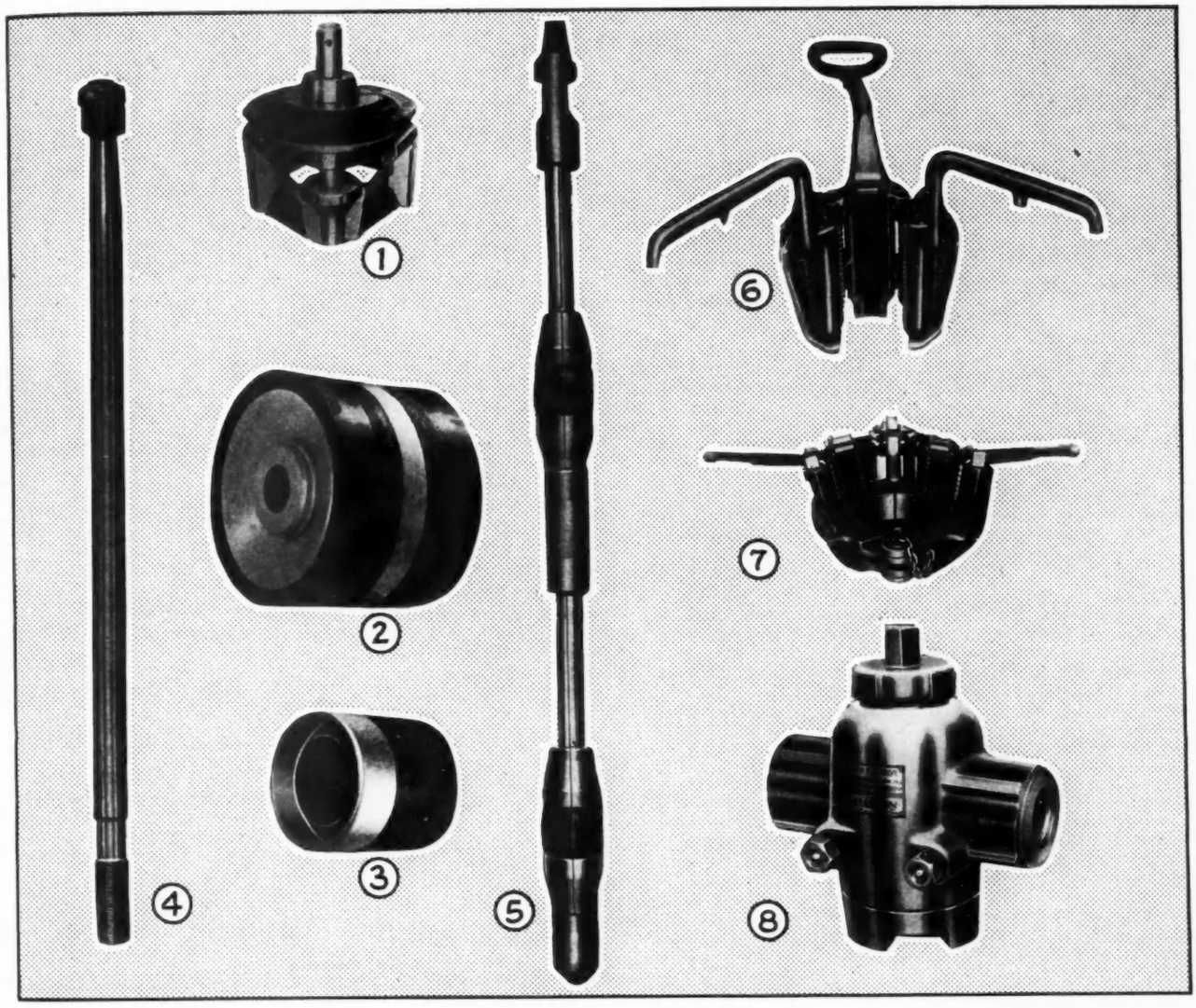
E. E. Ambrosius

*University of Oklahoma, Norman*

The University of Oklahoma, School of Mechanical Engineering, in cooperation with the Special Research Committee of Fluid Meters of the American Society of Mechanical Engineers, for the past several years has been conducting research on meters for the measurement of oil.

The first tests were performed on inferential-type meters such as orifices, nozzles and venturi tubes on 1½-, 2-, 3- and 4-inch lines. Diameter ratios from 0.125 to 0.84 were employed and the Reynolds numbers ranged from 50 to 60,000. This phase of the work was started in 1932 and is now complete. The data is in the hands of the committee, and a report is being prepared.

At present, attention is being directed toward the displacement type of meters, particularly those meters designed for metering of oils. These meters range in size from 1½ to 6 inches. Meter-accuracy tests are made at the University of Oklahoma, where special equipment is available. With this equipment, it is possible to vary flow rate through any meter from about 5 to 125 percent of its rated capacity, the maximum rate of flow being 450 gallons per minute. During these tests, the medium-grade oil in the system was heated by suitable heat exchangers, thus varying its viscosity, and information is obtained on viscosity and temperature effects. To insure accuracy, the meter

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readings were taken with the aid of a camera.

The results of the volumeter research show the general characteristics of the meters to be as follows: (a) slip in sealing; (b) pressure-slip relationship; (c) mechanical and hydraulic friction and (d) pressure drop resulting from fluid friction and driving metering parts.

## Transportation Problems Talked at Group Session

ONE full group session was given over to automotive transportation, a phase of operations of growing importance in the petroleum industry. Abstracts of the four papers presented follow:

### Safe Motor-Vehicle Transportation in Oil Fields

By R. B. Roaper
*Humble Oil and Refining Company, Houston*

The oil industry is a comparatively new one that embodies still a definite and newer department, oil-field transportation. From the days of the oxen teams to the modern tandems, this department constantly has improved methods to result in better work and fewer injuries to personnel. Only in the last six or seven years has concentrated and direct planning been applied to oil-field transportation; yet this brief study has produced results that not only have kept pace with the entire petroleum industry, but that offer splendid prospects for more efficient and safer operations in the future. To these pioneers and the present transportation units of the petroleum industry should be given the credit for this paper; and it is to these men and their profession that this paper is dedicated.

Factors affecting safe conditions are: Selection and classification of drivers, purchase and selection of equipment, and knowledge of field problems.

### Should Gross Vehicle-Weight Limitations Be Made Universal?

By J. W. Sinclair
*Union Oil Company of California, Los Angeles*

Progress in the removal of highway barriers is essential and desired by all; but not all are ready to concede that any policy which proposes to help backward states, at the expense of others, is a substantial contribution to the welfare of the nation as a whole.

A greater degree of uniformity than now exists has been advocated generally for a number of years. National codes of somewhat conflicting character have been formulated, learnedly and voluminously discussed only to be ignored subsequently by, or at least merely taken "under advisement," insofar as practical application is concerned. The first authoritative step towards the long-desired and necessary goal now is under way by the one body capable of dealing with the subject nationally. Reference is made to the Interstate Commerce Commission. The thoroughness of the commission's approach to the subject is indicated by its three preliminary reports in Ex Parte MC-15. It is the sincere hope of all interested in highway transportation that the calibre of interpretation accorded the informative data that are being accumulated will be equal to the thoroughness of the preparatory effort.

In the frank realization generally that among the foremost contributions to state barriers is the monumental lack of uniformity in states' requirements as to gross vehicle weights, some temerity is required to intimate even that immediate and complete uniformity in this regard might not promptly bring about a utopian condition.

### Preventing and Extinguishing Tank Truck Fires

By J. F. Winchester
*Standard Oil Company of New Jersey, New York*

The basic principles employed to prevent fires can be summed up in a few words: the application of business and engineering experience to the design and purchase of equipment of suitable character, and the continual employment of educational methods to inform employes, civic authorities and the general public as to the safe handling of the volatile materials that are transported within the petroleum industry.

To combat various conditions we decided to carry forward some experiments that have been in my mind for a long time, but which up to that time I questioned the advisability of because of the possible expense involved; namely, to install in and around a complete tank truck unit a series of spray jets creating an extinguishing system supplied with carbon tetrachloride or carbon dioxide, similar to an automatic sprinkler system within a factory or public building.

After installing this system, we then conducted a series of approximately 45 tests under variable conditions, which consisted of abnormal fires being created and then extinguished by means of the newly designed apparatus. The results found were: That severe fires in or around any part of the tank truck could be readily controlled, and the time required in each case was less than a minute. The amount of extinguishing material necessary to accomplish this was relatively small. The need for skilled application by personnel was eliminated.

Another interesting experiment giving promise of economy in operation and acting as a means of fire prevention has been tried. It is the use of a rubber compound to dissipate static in the place of a metal conductor.

### Protection Against Static Electricity

By J. M. Pearson
*Sun Oil Company, Philadelphia*

The phenomena that accompanies accumulation and release of static charges have been known to the human race and recorded since the time of the ancient Greeks. During the ages, our means for making experimental measurements and our coincident understanding have been prompted until the whole field of electrical knowledge belongs to the exact sciences. Basic principles now are established with extreme precision, and our theoretical tools are correspondingly reliable.

As the rubber tires on a tank truck roll over the pavement, about 70 square inches of each tire intimately are pressed against the pavement. The potential difference here is but a few hundredths of a volt. As the tire rolls, the separated charges are pulled apart, and the voltage on the tire tread not touching the pavement rises to between 2000 and 15,000 volts. This terrific electrical pressure drives a very small current in toward the rim, and a charge begins to accumulate on the truck body. As the voltage of the truck rises, a current begins to flow through the rim of the low-voltage part of the tire tread that touches the pavement. As the truck voltage rises, the inflow of current is opposed and the outflow of current increases until equilibrium is established. Unhappily, by far the greater part of each tire is not touching the pavement, so the voltage on the truck is almost the same as that in the free portion of the tire tread.

Thus, we have gradually accumulated a dangerous charge on the truck. The equal and opposite charge has been left in the ground and follows along under the truck as it moves over the ground, awaiting the first opportunity to re-unite with the charge on the truck body. Most of the common precautions now used as protection against static electricity are effective.

## *Mississippi Geologists Plan Alabama Field Trip*

The Mississippi Geological Society has announced plans for a field trip to Northwest Alabama December 6-8. Start at Tutwiler Hotel, Birmingham, Alabama, at 7:30 a.m., Friday, December 6, the day's itinerary will include a study of the section from the Cambrian through the Mississippian and Pennsylvanian formations in the Shades and Cahaba Valleys east of Birmingham. The party will return to Birmingham for the night. Saturday's itinerary will include an area north of Birmingham across the Warrior Basin to Huntsville, where Saturday night will be spent by the party. Sunday morning the party will go down the Tennessee Valley to the Wheeler and Wilson Dams and to the asphalt pits near Sheffield, disbanding at noon.

## *Plan New Simplified Pipe Specifications*

Adoption of a new casing list designed to reduce to less than 90 from around 200 the number of different sizes and grade of casing used by the petroleum industry was recommended last week by the American Petroleum Institute's Division of Production Committee on the Standardization of Oil Country Tubular Goods. The recommendation will be submitted for further and final ratification.

Upon ratification, the simplified list will be published in "API Standards 5-A" as tentative. Meanwhile the present institute casing list will be retained as standard until decision is reached to replace it with the revised list.

At present, there are more than 200 items of casing of different sizes and grades for use in drilling wells. The new list which will be called "API Casing List as Revised November 12, 1940" contains approximately 86 items of casing in the API grades F25, J55 and N80. The list was formulated with the intention that it contains all casing that may be required for the drilling of oil wells of any depth. The list includes all of the sizes of casing now listed in Table 5 of API Std. 5-A

with the exception of the 4¾-inch and 9-inch sizes which have been deleted, while 4½-inch and 5-inch sizes have been added.

For the larger sizes, 16-inch casing, shown in Table 10 of API Std. 5-A, has been retained. The 18⅝-inch, 21½-inch and 24½-inch sizes in this table have been replaced by 20-inch casing.

All casing will be furnished with the standard API round thread, eight threads per inch, ¾-inch taper per foot, with the exception of the 16-inch and 20-inch sizes, which will be furnished with the API sharp-threads, eight threads per inch, ¾-inch taper per foot.

## *Drilling Contractors Group Names Officers at Chicago*

Officers and directors of the newly formed American Association of Oilwell Drilling Contractors were elected in Chicago last week coincident with the American Petroleum Institute meeting.

J. E. Brantley, Los Angeles, was elected president; Harry L. Edwards, Houston, vice president at large; W. S. Churchill, Tulsa, vice president of rotary drilling; J. J. Klise, Wooster, Ohio, vice president of cable-tool drilling, and C. J. Paine, Dallas, secretary-treasurer.

By-laws, which have been in preparation for some time, were adopted, and provide for six classes of members: senior, consisting of those who occupy responsible executive, administrative or professional positions, including the rank of tool-pusher and above; junior members, consisting of drilling contractor employes below the rank of tool-pusher; associate members; sustaining members; contributing members, and honorary members.

Dues of sustaining members are to be based upon the number and size of active strings of tools owned.

It is proposed that the new association conduct an educational campaign among the employes of its sustaining members; that opportunity for discussion of methods and practices in drilling be made available; that studies be conducted to reduce the cost of drilling; that cost-accounting methods be studied, and that safety work be undertaken in an organized manner.

## *Illinois Conference Features Oil and Gas Discussions*

Papers on oil and gas subjects, a symposium on the Devonian formation, and dedication of the new Natural Resources Building on the University of Illinois Campus featured the Illinois Mineral Industries Conference held last week at Urbana.

The meeting opened November 14 with the morning devoted to informal gatherings and inspection trips through the new building, which includes offices of the Illinois Geological Survey. Provision has been made for filing of well logs, for study of cuttings and cores, drafting of log-strips and maps, preparation of reports, and handling of interviews and correspondence. The building houses fully equipped laboratories for analysis of oil, gas and brines, and for determination of porosity, permeability and saturation of oil sands.

The conference was sponsored by the Illinois Geological Survey, the Engineering Experiment Station of the University of Illinois, and the Illinois Mineral Industries Committee.

Interest in the Devonian has widened since completion a year ago of the first well in this formation in Illinois' Salem field. The Corniferous production of western Kentucky and southwestern Indiana is also of Devonian age, and interest in Devonian rocks has been further widened with completion of Devonian wells in Nebraska.

The first of two sessions of the Devonian symposium was held Thursday afternoon with F. W. DeWolf and K. C. Heald serving as chairmen. Abstracts of papers presented follow:

**The Devonian System in Southern Illinois**

By J. Marvin Weller

*Illinois Geological Survey*

The state's first 10,000-barrel oil wells, recently completed near Centralia, produce from Devonian limestone at a depth of 2900 feet. This and other Devonian rocks come to the surface and may be studied in the hills west of Anna in southern Illinois. The author described formations in that part of Illinois, and pointed out their similarities to and differences from Devonian rocks of other areas. The southern Illinois Devonian section is the thickest in the Mississippi Valley region, 1500 feet.

**Devonian Strata of Southeastern Missouri**

By Carey Croneis

*University of Chicago*

The Devonian sediments of southeastern Missouri are exposed in small, downfaulted blocks near the Mississippi River from Ste. Genevieve County to Perry County. Less disturbed early Devonian strata are exposed in Cape Girardeau County. Conditions are such that it has not been possible to establish all details necessary for their accurate correlation in the general region. It is evident, however, that on both sides of the river there are reasonably complete sequences from the Helderberg through the Hamilton. Regardless of method of correlation, the formations differ in Missouri and Illinois.

**Devonian of West-Central Tennessee**

By Kendall E. Born

*Tennessee Geological Survey*

Devonian rocks of west-central Tennessee are restricted to the western valley of the Tennessee River, except for isolated outcrops of Middle Devonian in the Central basin and two lower Devonian formations in the disturbed Wells Creek basin. In the valley region, the lower Devonian Helderberg group is so well developed that it is considered the standard section for this general region. The composite thickness in the area approximates 500 feet, with maximum local exposure of 150 feet. Subsurface studies show a rapid thinning on the northwestern flank of the Nashville arch. No data are available as to the nature of the westward extension of these rocks, since no wells have encountered a Devonian section in the embayment area. Possible regional correlations are presented in this paper, with discussion of lithology and areal distribution of individual formations.

**Subsurface Stratigraphy of Devonian System in Western Kentucky**

By Louise B. Freeman

*Kentucky Geological Survey*

Devonian and Silurian strata outcropping in southern Illinois can be traced into the subsurface of western Kentucky. Suggested correlations are based on comparisons of subsurface and outcrop samples. Warping of the basin has preserved lower and middle Devonian rocks in the deepest part, with overlap on progressively older Silurian as the crest of the Cincinnati Arch is approached. Most of the Devonian was removed from the region high on the flank of the arch, before the Chattanooga shale was deposited.

**The Devonian System in Indiana**

By A. H. Sutton

*University of Illinois*

The author described the surface Devonian of Indiana, including the Jeffersonville, Geneva, Pendleton, Sellersburg and New Albany formations. The Jeffersonville, Geneva and Pendleton are considered to be lithologic facies of the same stratigraphic unit. They are of Onandoga age and are correlated with the upper portion of the Grand Tower limestone of Illinois. The Sellersburg is of Hamilton age, and is equivalent to the Lingle limestone and possibly to the Misenheimer shale of Illinois. Evidence is

[*Continued on page 88*]

**Officers of American Association of Oilwell Drilling Contractors, are, left to right, C. J. Paine, secretary treasurer; J. E. Brantley, president, and W. S. Churchill, vice president of rotary drilling.**

## *Crude Output and Refinery Runs Moderate; Stocks Cut*

The industry lately has been doing a fairly satisfactory job of fitting operations into the current picture in oil, having held both crude production and refinery runs down to moderate levels, with the result that inventories of oils have reacted favorably.

Crude output was close to indicated market demand in the week ended November 9, and runs to stills were further curtailed, although the refineries still were processing more crude than economically desirable.

Gasoline production consequently decreased, and with demand holding up relatively well, a further substantial withdrawal from storage was possible.

Yields of light fuel oil apparently were comparatively large, and despite increased consumption, only a minor withdrawal of that product from storage was necessary.

### Production and Runs

United States crude oil production rose 104,250 barrels to 3,584,200 daily in the week of November 9, according to the American Petroleum Institute, as Texas output returned to a normal basis following an extra shutdown day in the previous week. The output was, however, only 14,200 barrels above estimated market demand, and it was 5.6 percent under that in the corresponding week last year.

Crude runs to stills were reduced to 3,510,000 barrels daily, from 3,535,000 the week before, and were only fractionally higher than in the comparable week last year. The runs were, however, about 100,000 barrels larger than the economically desirable daily average for the fall and winter period as a whole.

Production of gasoline came down to 11,502,000 barrels for the week of November 9, as compared with 11,808,000 barrels turned out in the preceding 7 days. The production in November of last year averaged 12,209,000 barrels weekly.

Gasoline continued to come out of storage, as the total on hand in the United States dropped 927,000 barrels to 79,847,000 barrels as of November 9. In contrast, gasoline was going into storage last year as early as the middle of October. The above total was about 5,500,000 barrels larger than that of 74,360,000 barrels in storage a year previously, a difference of 7.4 percent.

Stocks of gas oil and distillate fuel continued to shrink gradually, having contracted from 48,615,000 to 48,408,000 barrels in the week ended November 9, but they still were not far under the all time high level of 48,893,000 barrels reached October 26, and they exceeded by 9,000,000 barrels the inventory held at the corresponding time last year. The early severe weather of the past week appeared very likely, however, to cause a material dipping into heating oil stocks.

Inventories of heavy fuel oil continued to decrease in the week of November 9, having come down to 107,687,000 barrels from 108,199,000. The amount left in storage was more than 5,000,000 barrels smaller than that on hand a year previously, a difference of 4.6 percent.

Crude oil stocks totaled 263,820,000 barrels on November 2, according to the United States Bureau of Mines, having increased a little over a million barrels within the week. At the corresponding time last year they were near the lowest level since 1922—at 230,994,000 barrels—as the effect of the late-August shutdowns in the Mid-Continent still was reflected.

## *Refinery Activity in East Texas at Low Level*

Refinery operations in the East Texas field are currently at the lowest level since the area was invaded by skimming plants early in 1931. Only six plants operated during the first week in November, and their combined crude and semi-refined crude runs to stills declined to an average of 12,300 barrels daily. Lunch Refining Company's two plants accounted for 4400 barrels of the daily runs.

Cutrate competition is prevalent among the East Texas plant owners, and prices on gasoline average one cent below those received one year ago, although the posted price for crude remains unchanged at $1.10 per barrel. Wholesale prices on third-grade gasoline, supported by federal tenders, currently range from 3½ to 4 cents per gallon, while state tendered motor fuel marketed by tank cars and truck varies from 3 to 3½ cents per gallon.

## *Fuel Oils in Good Demand; Pennsylvania Crude Raised*

Markets of the industry currently are generally firm, after having displayed strength last week through advances of crude prices in the Appalachian region and stiffening of prices of light fuel oils.

The 15-cent raise in Pennsylvania-grade postings was believed to indicate a better outlook for the lubricant markets, aside from reflecting local refinery demand for crude in excess of current production.

The unusually early severe weather of the past week naturally caused extraordinary demand for heating oil, and prices of that product tended to advance, as supplies proved to be tightly held.

Increases in prices of light fuel oils and Diesel oil on the Atlantic Coast were due primarily, however, to the continued climbing of domestic tanker rates.

Both refined and natural gasolines offered contracts in the generally bright market picture, as cold weather cut down consumption of motor fuel in the North. Prices of refined gasoline remained mostly unchanged, having been at extremely low levels for months, but quotations on natural gasoline were lowered in North Texas from 2½ to 2 cents a gallon.

Gasoline stocks were further reduced in the week ended November 9, the American Petroleum Institute reported, and that fact was constructive, as the

## Trends of Operations and Changes in Stocks

**Figures are from American Petroleum Institute weekly reports, except those on crude stocks, which are from Bureau of Mines weekly reports**

| WEEK ENDED | Crude Oil Production (Barrels Daily) | Crude Runs to Stills (Barrels Daily) | Crude Oil Stocks (Barrels) | Gasoline Stocks (Barrels) | ¶ FUEL OIL STOCKS | |
|---|---|---|---|---|---|---|
| | | | | | Gas Oil & Dist. Fuels | Residual Fuel Oil |
| **1938:** | | | | | | |
| November 12 | 3,243,250 | 3,180,000 | 273,394,000 | [6]67,551,000 | 34,175,000 | 120,491,000 |
| December 10 | 3,245,100 | 3,150,000 | [6]269,509,000 | 68,687,000 | 32,068,000 | 118,711,000 |
| **1939:** | | | | | | |
| April 22 | 3,526,700 | 3,280,000 | 277,156,000 | [2]87,769,000 | 21,085,000 | 105,035,000 |
| April 29 | 3,568,200 | 3,405,000 | 278,440,000 | 86,794,000 | [7]25,844,000 | [7]108,409,000 |
| May 6 | 3,580,900 | 3,275,000 | [2]278,607,000 | 86,216,000 | 26,167,000 | 108,597,000 |
| July 29 | 3,539,100 | 3,460,000 | 268,513,000 | 77,887,000 | 34,900,000 | 114,053,000 |
| August 5 | [1]3,909,400 | 3,445,000 | 268,982,000 | 76,431,000 | 35,601,000 | 114,512,000 |
| August 26 | [8]1,690,800 | 3,475,000 | 246,982,000 | 73,475,000 | 37,722,000 | 116,237,000 |
| September 30 | 3,658,200 | 3,560,000 | 233,023,000 | 71,168,000 | 38,081,000 | 115,466,000 |
| October 7 | 3,435,850 | 3,505,000 | 231,564,000 | [6]71,152,000 | 38,549,000 | 114,397,000 |
| October 21 | 3,771,550 | [3]3,650,000 | [3]229,127,000 | 72,122,000 | 39,358,000 | 115,060,000 |
| October 28 | 3,498,500 | 3,520,000 | 230,453,000 | 72,660,000 | 39,562,000 | 114,786,000 |
| November 25 | 3,818,100 | 3,510,000 | 231,811,000 | 75,595,000 | 38,527,000 | 112,106,000 |
| December 30 | 3,545,000 | 3,445,000 | 237,742,000 | 80,985,000 | 34,184,000 | 106,680,000 |
| **1940:** | | | | | | |
| January 27 | 3,611,600 | 3,470,000 | 237,339,000 | 87,914,000 | 27,407,000 | 103,015,000 |
| February 24 | 3,732,100 | 3,490,000 | 240,836,000 | 96,719,000 | 25,390,000 | 103,419,000 |
| March 30 | 3,841,250 | 3,585,000 | 250,561,000 | 101,370,000 | 23,778,000 | 105,081,000 |
| April 20 | 3,858,550 | 3,535,000 | 254,881,000 | [1]102,817,000 | 24,779,000 | 103,323,000 |
| April 27 | 3,845,250 | 3,555,000 | 256,670,000 | 102,452,000 | 24,997,000 | 102,552,000 |
| May 25 | 3,835,650 | 3,580,000 | 259,330,000 | 100,297,000 | 28,356,000 | 104,015,000 |
| June 22 | 3,846,450 | [3]3,690,000 | 260,891,000 | 97,276,000 | 32,751,000 | 104,683,000 |
| June 29 | 3,639,550 | 3,625,000 | 262,059,000 | 95,142,000 | 33,590,000 | 104,486,000 |
| July 27 | 3,690,400 | 3,555,000 | 262,579,000 | 90,173,000 | 38,981,000 | 105,924,000 |
| August 31 | 3,501,350 | 3,575,000 | 265,865,000 | 85,393,000 | 44,766,000 | 108,774,000 |
| September 28 | 3,799,950 | 3,600,000 | 263,609,000 | 82,373,000 | 47,986,000 | 108,450,000 |
| October 5 | 3,488,800 | 3,555,000 | 263,551,000 | 82,256,000 | 48,187,000 | 107,964,000 |
| October 12 | 3,641,550 | 3,555,000 | 261,511,000 | 81,927,000 | 48,743,000 | 108,449,000 |
| October 19 | 3,667,550 | 3,525,000 | 262,098,000 | 81,656,000 | 48,841,000 | 108,141,000 |
| October 26 | 3,640 300 | 3,565,000 | 262,746,000 | 80,891,000 | [1]48,893,000 | 108,475,000 |
| November 2 | 3,479,950 | 3,535,000 | 263,820,000 | 80,774,000 | 48,615,000 | 108,199,000 |
| November 9, 1940 | 3,584,200 | 3,510,000 | ..... | 79,847,000 | 48,408,000 | 107,687,000 |
| November 9, 1939 | 3,797,200 | 3,497,000 | [4]230,994,000 | 74,360,000 | 39,431,000 | 112,902,000 |
| Change in past year | —5.6% | +0.4% | +14.4% | +7.4% | +22.8% | —4.6% |

[1] All time peak. [2] Peak for year. [3] Lowest since April, 1922. [4] Stocks, November 2, 1939.
[5] Lowest since October, 1922, due to shutdown of six Mid-Continent States. [6] Lowest for year.
[7] Prior to April 29, 1939, data did not include stocks at terminals, in transit, etc., except in California.
[8] October, 1939, daily average.

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# Wholesale Prices of Refined Products

| | Range late Last week (Cents a gal.) | | Changes from week Before | |
|---|---|---|---|---|
| **REFINED GASOLINE** | | | | |
| **Oklahoma Refineries:** | | | | |
| 60 Octane and under | 3⅝ | 4¼ | ... | ... |
| 63-66 Octane | 4⅛ | 4½ | ... | ... |
| 72-74 Octane | 4½ | 5 | ... | ... |
| **Mid-Western Tank Car:** | | | | |
| 60 Octane and under | 3⅝ | 4¼ | ... | ... |
| 63-66 Octane | 4⅛ | 4½ | ... | ... |
| 72-74 Octane | 4½ | 5 | ... | ... |
| **New York Harbor:** | | | | |
| 68-70 Octane | 5 | 5½ | ... | ... |
| 72-74 Octane | 5 | 6½ | ... | ... |
| **Gulf Coast:** | | | | |
| 60 Octane unleaded | 3⅝ | 4½ | ... | ... |
| 65 Octane unleaded | 3⅝ | 4⅝ | ... | ... |
| 72-74 Octane leaded | 3¾ | 4¾ | ... | ... |
| **NATURAL GASOLINE** | | | | |
| **Grade 26-70:** | | | | |
| F.O.B. Group 3 | 2¾ | 2¾ | ... | ... |
| F.O.B. Breckenridge, Texas | 2 | 2 | —½ | —½ |
| **KEROSENE** | | | | |
| **Oklahoma Refineries:** | | | | |
| 41-43 water white | 3⅞ | 4 | ... | ... |
| 42-44 water white | 4 | 4⅛ | ... | ... |
| **Mid-Western Tank Car:** | | | | |
| 41-43 water white | 3⅞ | 4⅛ | ... | ... |
| 42-44 water white | 4 | 4⅜ | ... | +¼ |
| **New York Harbor** | 5⅛ | 5½ | ... | +⅜ |
| **RANGE OIL** | | | | |
| At Oklahoma Refineries | 3½ | 3¾ | ... | ... |
| In Mid-Western Market, Group 3, basis | 3⅝ | 3⅝ | ... | ... |
| **LIGHT FUEL OILS** | | | | |
| **Oklahoma Refineries:** | | | | |
| No. 1 straw | 3⅜ | 3½ | ... | ... |
| No. 3 | 3¼ | 3⅜ | ... | ... |
| **Mid-Western Tank Car:** | | | | |
| No. 1 white | 3½ | 3⅝ | ... | ... |
| No. 3 | 3⅛ | 3⅜ | ... | ... |
| **New York Harbor:** | | | | |
| No. 1 | 5⅛ | 5½ | +⅜ | +⅜ |
| No. 3 | 4½ | 4½ | +⅜ | ... |

| | Range late Last week (Per Bbl.) | | Changes from week Before | |
|---|---|---|---|---|
| **HEAVY FUEL OILS** | | | | |
| **Oklahoma Refineries:** | | | | |
| No. 6 | $0.55 | $0.55 | ... | ... |
| **Mid-Western Tank Car:** | | | | |
| No. 5 | .75 | .75 | ... | ... |
| No. 6 | .50 | .50 | ... | ... |
| **New York Harbor:** | | | | |
| No. 5 | 1.35 | 1.55 | ... | ... |
| No. 6 | 1.15 | 1.25 | ... | ... |
| **BUNKER C FUEL OIL (Per barrel, ships bunkers)** | | | | |
| Gulf Coast | $ .80 | $ .90 | ... | ... |
| New York Harbor | 1.15 | 1.25 | ... | ... |
| **DIESEL OIL (Per barrel, ships bunkers)** | | | | |
| Gulf Coast | $1.50 | $1.70 | ... | ... |
| New York Harbor | 1.85 | 1.85 | +15 | +15 |
| Los Angeles Basin, 27 gravity | 1.15 | 1.35 | ... | ... |
| **LUBRICATING OIL (Cents a gal.)** | | | | |
| **Oklahoma Refineries:** | | | | |
| Bright Stock, 150-160 viscosity at 210°, 10-25 pour test | 13 | 15½ | ... | ... |
| Neutral oil, pale No. 3 color, 150 viscosity at 100°, 0-10 pour test | 8 | 10¼ | ... | ... |
| **Western Pennsylvania:** | | | | |
| Bright Stock, 145-155 viscosity at 210°, 25 pour test | 12 | 13 | ... | ... |
| Neutral Oil No. 3 color, 150 viscosity at 70°, 25 pour test | 19 | 19 | ... | ... |

industry in some years begins to accumulate gasoline in storage as early as the middle of October.

The prices of Pennsylvania grade crude were raised 15 cents a barrel by several large purchasers on November 12. The top price now paid, on Bradford-Allegany crude, is $2 a barrel. That oil was posted at $2.75 a barrel from January 1, 1940, until May 22, and then within about three months it was cut 90 cents, to $1.85 a barrel. Reductions of 25 cents each were made on May 22, June 18, and July 12, and a 15-cent cut was posted on August 28.

The November 12 increase was a surprise to many refiners and producers in the Appalachian region, some having thought that crude postings might be further reduced rather than raised. But others pointed out that in view of the comparatively large refinery runs lately, keener competition for crude and possibly higher prices were to be expected.

For several weeks, refinery consumption of Pennsylvania-grade crude has run higher than output of the wells, and consequently, stocks have been decreasing. Bureau of Mines reports show that the inventory reached 4,798,000 barrels on September 21 and subsequently diminished 4,656,000 barrels as of November 2, a withdrawal of 142,000 barrels having been made within 6 weeks. The draft on stocks averaged, therefore, almost 24,000 barrels weekly, or 4000 barrels a day.

The new price for Southwestern Pennsylvania crude is $1.65, and that for Eureka, West Virginia, is $1.59. National Transit, posted by the Pennzoil Company, ranges from $1.88 to $1.93.

Rates for chartering tankers for moving oil from the Gulf Coast to the Atlantic seaboard last week were holding steady at the comparatively high levels reached in the past few months, and further advances were expected. Few boats were available, and greater, rather than smaller, demand for tonnage was in prospect. Clean boats last brought 48 cents a barrel for gasoline, 51 cents for kerosene, and 54 cents for No. 2 fuel oil. Dirty boats were last fixed at 40 cents for 30-gravity or lighter crude and 45½ cents for 10-20 gravity fuel oil.

# United States Crude Oil Production Near Market Demand

## Estimates Compiled by THE OIL WEEKLY

| DISTRICT OR STATE | Bureau of Mines Estimate of Daily Demand (Nov.) | State Allowable (Barrels Daily in Nov.) | BARRELS DAILY FOR WEEK ENDED Nov. 9 | Nov. 16 |
|---|---|---|---|---|
| **TEXAS—** | | | | |
| Texas Panhandle | ..... | ..... | 74,000 | 61,800 |
| North Texas | ..... | ..... | 107,600 | 110,400 |
| West Central Texas | ..... | ..... | 30,500 | 30,500 |
| West Texas | ..... | ..... | 223,250 | 214,700 |
| East Central Texas | ..... | ..... | 78,100 | 75,100 |
| East Texas Field | ..... | ..... | 375,500 | 374,600 |
| South Texas | ..... | ..... | 210,850 | 194,900 |
| Texas Gulf Coast | ..... | ..... | 245,550 | 233,800 |
| **Total Texas** | **1,291,000** | **1,324,000*** | **1,345,350** | **1,295,800** |
| **CALIFORNIA—** | | | | |
| Long Beach | ..... | ..... | 43,200 | 42,900 |
| Midway-Sunset | ..... | ..... | 54,800 | 55,000 |
| Kettleman Hills | ..... | ..... | 37,700 | 40,500 |
| Wilmington | ..... | ..... | 81,000 | 80,400 |
| Others | ..... | ..... | 398,900 | 402,600 |
| **Total California** | **583,000** | **571,000†** | **615,600** | **621,400** |
| **OKLAHOMA—** | | | | |
| Oklahoma City | ..... | ..... | 89,550 | 97,150 |
| Seminole Area | ..... | ..... | 100,625 | 99,420 |
| Others | ..... | ..... | 202,650 | 199,895 |
| **Total Oklahoma** | **413,000** | **390,000** | **392,825** | **396,525** |
| **ILLINOIS—** | | | | |
| Salem | ..... | ..... | 136,000 | 135,600 |
| Louden | ..... | ..... | 66,000 | 71,200 |
| Centralia | ..... | ..... | 17,900 | 17,890 |
| Other New Pools | ..... | ..... | 111,700 | 108,200 |
| Old Pools | ..... | ..... | 10,600 | 10,300 |
| **Total Illinois** | **385,000** | ..... | **342,300** | **343,100** |

| DISTRICT OR STATE | Bureau of Mines Estimate of Daily Demand (Nov.) | State Allowable (Barrels Daily in Nov.) | BARRELS DAILY FOR WEEK ENDED Nov. 9 | Nov. 16 |
|---|---|---|---|---|
| **LOUISIANA—** | | | | |
| North Louisiana | ..... | ..... | 67,100 | 66,800 |
| South Louisiana | ..... | ..... | 210,500 | 215,500 |
| **Total Louisiana** | **274,000** | **279,973** | **277,600** | **282,300** |
| **KANSAS** | **186,000** | **190,000** | **168,950** | **192,200** |
| **NEW MEXICO** | **104,000** | **104,000** | **101,100** | **101,500** |
| **EASTERN STATES—** | | | | |
| Pennsylvania Grade | ..... | ..... | 72,100 | 69,200 |
| Others, Eastern | ..... | ..... | 20,200 | 20,200 |
| **Total Eastern States** | **86,400** | ..... | **92,300** | **89,400** |
| **MOUNTAIN STATES** | | | | |
| Wyoming | 75,000 | ..... | 72,600 | 73,800 |
| Montana | 18,900 | ..... | 18,200 | 18,100 |
| Colorado | 3,700 | ..... | 3,400 | 3,500 |
| **Total Mountain States** | **97,600** | ..... | **94,200** | **95,400** |
| **MICHIGAN** | **51,000** | **48,000§** | **47,300** | **47,600** |
| **ARKANSAS** | **71,000** | **69,508** | **69,100** | **69,500** |
| **INDIANA** | **14,200** | ..... | **20,200** | **19,800** |
| **MISSISSIPPI** | **13,800** | ..... | **14,650** | **16,100** |
| **NEBRASKA** | ..... | ..... | **2,200** | **2,200** |
| **‡Total 8 Prorated States** | **2,973,000** | **2,976,481** | **3,018,825** | **3,006,825** |
| **Total United States** | **3,570,000** | ..... | **3,584,675** | **3,572,825** |

* Net basic daily allowable in November; Texas fields were ordered shut down November 9, 10, 16, 17, 24, 28 and 30.
† Recommendation of Conservation Committee of California Oil Producers.
§ Estimates of actual production that will occur under prescribed regulations, which do not fix a definite state total allowable.
‡ Texas, California, Oklahoma, Louisiana, Kansas, New Mexico, Arkansas, Michigan.

### *Federal Court Sustains Kansas Proration Plan*

Right of the Kansas Corporation Commission to divide the state's oil market equitably between prorated pools was sustained by a majority decision of a three-judge federal court. Upholding the commission were Judges Sam G. Bratton, of New Mexico, and Richard J. Hopkins, of Kansas. Dissenting was Judge Walter A. Huxman, of Kansas.

The decision acted to dissolve a temporary restraining order obtained by the plaintiffs, Bay Petroleum Corporation, Denver, and Morgan, Cobb and Flynn, operating in the Otis pool and supplying oil to the Bay Petroleum Corporation's refinery at McPherson, Kansas.

According to Theo. A. Morgan, conservation director, "approximately 14,000 barreals per month" was directly affected by the decision, this amount having been abolished as special allowable by the commission in May, 1939, following revision of the Kansas proration law.

Following announcement of the court's decision, allowable of the pool was cut to about 11,000 barrels per month.

### *Market for East Texas Crude Shows Weakness*

Demand for East Texas spot oil has declined in recent weeks, and independent pipe line companies without contracts are in distress. The entry of Pan American Pipe Line Company as a buyer and trunk line operator has enabled some of the units to sell out on reasonable terms.

Shell Oil Company failed to renew its annual contract involving the purchase of 20,000 barrels of East Texas crude monthly from the Longview Gathering System, Inc. (Danciger Interests), which was receiving the posted price, plus 5 cents gathering tariff. The latter has been storing its runs since the contract was terminated November 1, and is attempting to find a temporary market at the posted price delivered.

Shell Oil Company has renewed contract for one year, ending November 16, 1941, to purchase a maximum of 35,000 barrels of East Texas crude monthly from the Houston Oil Company. The latter gathers the oil from its properties and delivers to Shell Pipe Line Corporation in the field, but will receive only 2½ cents per barrel for this service under the terms of the new contract. Five cents per barrel pipeage prevailed heretofore.

### *Short Louisiana Oil Line Placed in Operation*

Triangle Drilling Company has placed in operation a 17½-mile 4-inch welded crude line, extending from the Sugar Creek pool, Claiborne Parish, Louisiana, to Weller station on the Standard Oil Company of Louisiana's trunk line system. The pool is producing 500 barrels of 33-gravity oil daily, and was formerly served by the Caddo Crude Oil Purchasing Company.

### *Illinois A.P.I. Meets at Salem, December 6*

The Illinois Basin Chapter of the American Petroleum Institute will hold its next meeting December 6 at the Southern Gardens, Salem.


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**Lv. HOUSTON . . . . . 11:30 P. M.**
**Ar. DALLAS . . . . . *6:55 A. M.**

***Southbound***

**Lv. DALLAS . . . . . 11:30 P. M.**
**Ar. HOUSTON . . . . . *6:30 A. M.**
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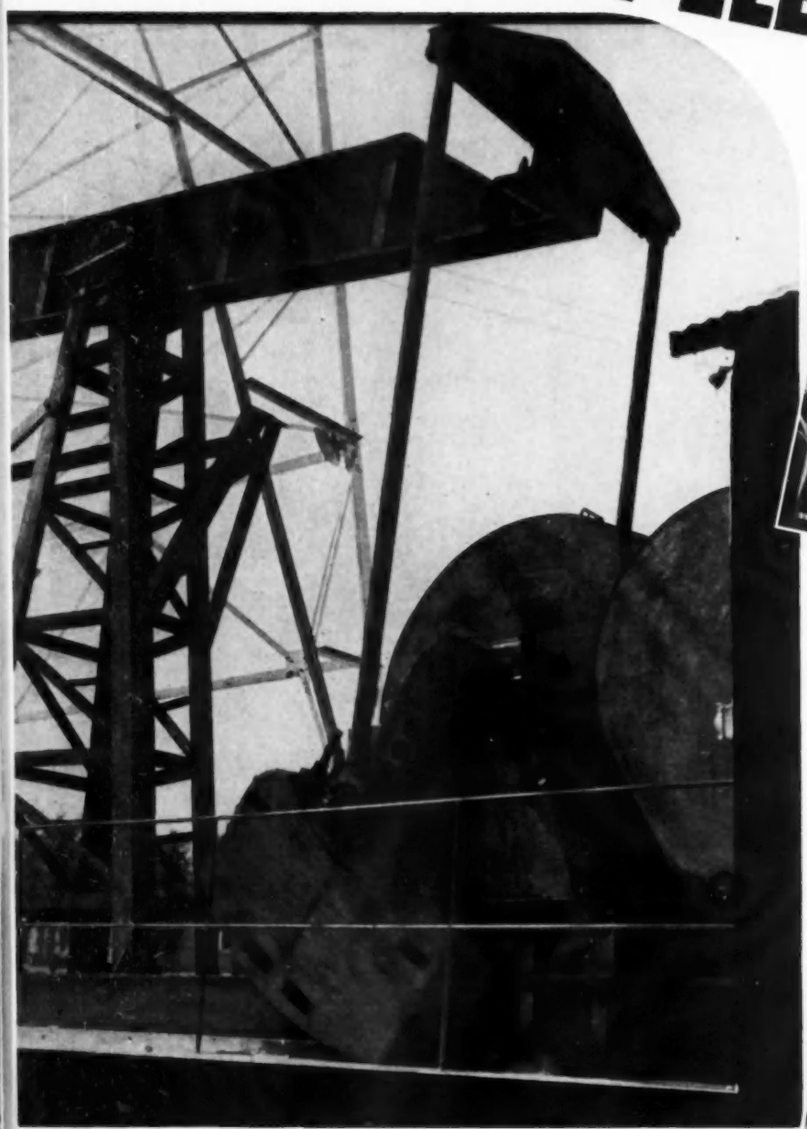

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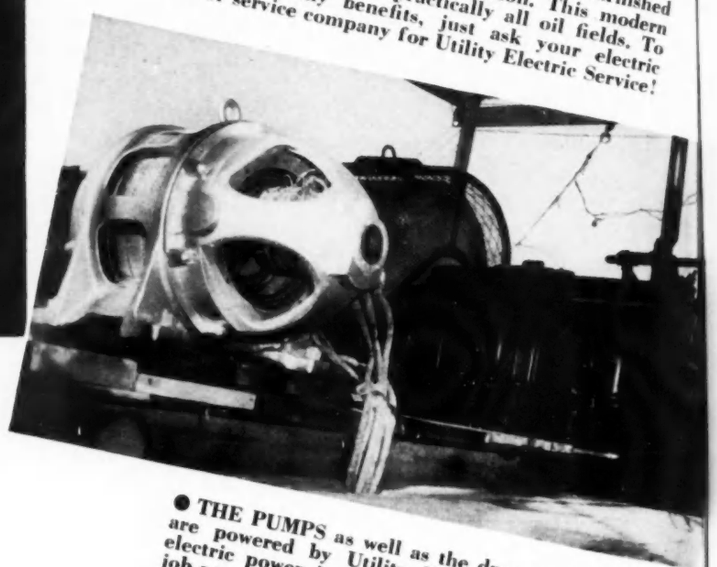

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# U. S. FIELD OPERATIONS

## Illinois

### *Effingham Test Indicates New McClosky Lime Pool*

A new pool was promised for Effingham County with near completion of Kilpatrick & Hartshorn's Mason Community 1, SE SE NW 22-7n-5e, flowing natural by heads from McClosky lime at 2489-96 feet. Casing was set at 2485 feet. The well is 12 miles east of production in the St. James field of Fayette County, and touched off an intense royalty buying and trading campaign. Operators were continuing to clean out the well, which was making an estimated 10 barrels of oil an hour.

In Jasper County, plug was being drilled at another prospective field opener, Buerkle-Schieck's Karmickle 1, NE 5-6n-10e, which flowed during a drill-stem test of the McClosky at 2770-2773 and 2792-2797 feet. Total depth is 2808 feet. It is 1½ miles northwest of the West Liberty field and 1½ miles southwest of the Boos field.

The Carter Oil Company was assured of a commercial producer and pool opener in Gallatin County when R. M. York 1, SE SE SW 33-7s-8e, swabbed 222 barrels of oil of which 6 percent was water, in 24 hours from Palestine at 1704-32 feet. In previous tests of the horizon the well had made more water than oil. Swabbing was being continued. York 1 found saturation in six formations, but the best pay area appeared to be in the Palestine. The well has a total depth of 2050 feet following a plug-back from the Hardinsburg which was tested but produced mostly water.

Kingwood Oil Company cemented casing at an outpost to the Dale field, Hamilton County, Prince 1, NW SW NW 31-5s-7e, to test a McClosky show. Casing was set at 3240 feet, and total depth was 3256 feet. The test had been shut down on orders for several days before the company decided to cement pipe. Hopes were held for only a small producer at best. Kingwood was putting its Williams 1, C S½ SE NE 2-4s-6e, on the pump. It is a wildcat in the northern part of Hamilton County, and on swabbing tests has produced at the rate of about 100 barrels of oil to 200 barrels of water a day. It is producing from McClosky pay at 3461-66 feet.

#### Fayette County Test

Kingwood Oil Company's closely-watched Fayette County wildcat, Aukamp 1, SW SE 30-5n-3e, was drilling at 1000 feet, slated to test the Devonian unless commercial production is found at more shallow depths. It is three miles north of the company's recently abandoned Lowe 1 in northern Marion County, which was dry in the McClosky.

Another squeeze job was set at John Powell's Rineker 1, semi-wildcat in Shelby County, SW SW SE 22-10n-5e, which was showing for a producer in the Aux Vases at 1942 feet. The well pumped 55 barrels in 40 hours before water encroached. It is near the county's only producer, completed more than a year ago.

The Ohio Oil Company was nearing 1200 feet at its General American Life Insurance Co. 1, wildcat in Pope County, E½ SE SE 10-11s-5e, one of the southernmost operations in Illinois. A light show was found in the Tar Springs at 785 feet.

The fourth producer in the new Cypress sand field north of Mt. Carmel, Wabash County, has been completed as a 100-barrel well. It is O'Mera Brothers' E. E. Felty 1, C W½ NW SE 17-1s-12w. East of this well, A. A. Cameron was cleaning out Utter 1, SW SE NE 17-1s-12w, a Delta Drilling Company farmout. Cameron found 14 feet of Cypress saturation from 2030 feet.

A White County wildcat a mile northwest of Carmi, Carl Robinson's Taylor estate 1, C S½ NW NE 11-5s-9e, was shut down at 3424 feet following an electric log. McClosky carried 4½ feet of light saturation but it did not appear to be capable of commercial production.

A west offset to a Wayne County discovery well was waiting on cement, M.I.O.U. Corporation's G. H. French 2, C W½ SE SE 4-3s-8e, which recovered saturation in the McClosky. Another operation also was under way in the area, S. & G. Oil Company's Carroll Shreves 1, C E½ SW NE 4-3s-8e.

Plug still had not been drilled at a prospective pool opener in Franklin County, E. S. Adkins' Orient Coal 1, near Benton in the NE SW SE 24-6s-2w, where Tar Springs saturation at 2111-23 feet is to be tested.

B. E. Martin said his Robinson 1, Section 4-2n-1e, first Trenton test in the Sandoval field, Marion County, would be deepened 200 feet from a present depth of 4397 feet. Decision to deepen the well was made because of a favorable soil analysis survey. The test has been shut down for several days after unsuccessfully testing two Trenton shows at 4270 and 4367 feet.

The second Trenton test in the Centralia pool, Clinton County, Allen Borton's Storer 1, NE 13-1n-1w, was being cleaned out following a squeeze job to shut out Devonian water. Total depth is 4058 feet. The test has been twice acidized and shot with 20 quarts. Before the water encroachment, it swabbed fluid at the rate of 12 barrels an hour.

An Edwards County wildcat, which if successful would start a townsite drilling boom in Albion, Don Baines' Nellie Hodgeson 1, NW NE NE 1-2s-1e, was drilling below 1500 feet.

## Indiana

### *Locate Test Between New Harmony and South Griffin*

Anderson Griffin Properties, Inc., located Frank O. Faul 1, NE SE 11-4s-14w, Posey County wildcat, two miles northeast of production in the New Harmony pool and about three miles southeast of South Griffin field. Location lies north and west of a failure drilled by Superior Oil Company in NE 26-4s-14w, which ran extremely low and indicated a sharp dip to the east. Another Posey County first report was on Harris Island, in the Ohio River, just opposite Mt. Vernon, Indiana, which will be drilled by L. F. Boone.

In Montgomery Township, Gibson County, Mohawk Drilling Company and Major Oil Company's John W. Harmon 1, NE SE SW 17-3s-11w, perforated casing opposite McClosky show at 2528-35 feet and was swabbing with a show of oil and sulphur water.

Abandoned was Harry Lewis, Jr.'s Posey County wildcat in Point Township, Isaac Wolf 1, SW NE SE 25-7s-14w, after an unsuccessful attempt to shut off water in Tar Springs and Waltersburg sands. The operator announced location for Wolf 2, SW NE SE 25-7s-14w, 1320 feet north of the failure.

A 4-mile north extension attempt for the new McClosky pool south of Vincennes, Knox County, W. C. McBride's John Brevort 1, C S½ NE NW 1-2n-11w, was drilling at 1970 feet, dry through the McClosky.

Waiting on cement was an east outpost to the Vincennes field, W. C. McBride's Metropolitan Life Insurance Company 2, SW SW NE 24-2n-11w, with casing set to test McClosky saturation from 1887-98 feet. Hole was bottomed at 1900 feet.

A. W. Cherry and Barron Kidd's Hall-Garrett 1, NW NW SW 31-2s-12w, Gibson County wildcat about eight miles southwest of Owensville, was coring for the Cypress.

In Black Township, Posey County, near Welborn Station and seven miles south of the New Harmony pool, Illinois Production Corporation located John Larkin 1, NE NE SW 17-6s-14w. Whisenant and Trenchard, contractors, were moving in rotary.

On the southeast edge of the Griffin field, Gibson County, Continental Oil Company's Stella Green 1, SW SW SE 26-3s-14w, set 5½-inch casing at 2222 for test of Tar Springs at 2170-90 feet. Malleable casing was set opposite Waltersburg show at 2108-18 feet. Hole was bottomed through a dry McClosky.

In Crawford County, Whisky Run Township, T. C. Bugg, J. C. Barnett and George Nelson were drilling at 200 feet with cable tools for Hugh Baylor 1, SE SW 27-1s-2e, northwest of the old Corydon gas field.

In the Rockport gas field of Spencer County, Gulf Refining Company's Ben H. Schrouds 1, NE SE NE 5-8s-6w, was shut down for orders at 631 feet, on top of a strong gas show.

# Kansas

### *Two Oil Strikes and One Gas Area for the Week*

Two new oil pools and one gas area were opened in Kansas, with an edge producer finding production from Bartlesville sand in Couch field of northeast Cowley County. Field work in the state has been generally retarded except on wells at critical stages due to the unexpected cold wave which caught many crews unprepared.

In the central part of the state, T. Williams and L. Morine's Henne 1, SW SW NE 21-17-1w, McPherson County, had a fill-up of 3000 feet of oil from Mississippi chat, drilled to 2662 feet. Four feet of saturation were picked up above bottom. The test, two miles west of Roxbury pool, appears to open a new pool not directly related to the nearby production.

In northeast Cowley County, where Couch pool has been in the initial stages of development, a north edge well was given a short test and operators estimated the flow equal to about 325 barrels per hour. While a complete test may lower this estimate considerably, the well is indicated to be large and to leave the north edge of the field wide open to additional drilling. The test, Ryan Consolidated Oil Company's Victory Life 1, SW SW SE 12-30-5e, found the top of Bartlesville sand at 2786 feet and drilled to 2846 feet where the test was made. Tankage was filled, and the well shut in for erection of additional crude storage.

In eastern Kansas, a wildcat between Toronto and Brinegar fields, eastern Greenwood County, found a shallow sand saturated. Casing was filled with hole two feet into the section. The new well is Lew & Dunn's Keller 1, C E½ NE SW 22-26-13e, now bottomed at 1471 feet in Bartlesville sand. Additional tankage is being erected. This strike is on the shoreline deposition sector of east-central Kansas where important shallow sand bodies are lensing along four trends. Exploration, chiefly by means of the drill, has been heavy since attention was called to the probability that fields other than those already producing exist along trends not defined by past effort.

A new gas field has been proven at E. K. Casey Drilling Company et al's Coons 1, C W½ SW SW 13-19-1w, northeast of the rich Ritz-Canton oil and gas field of McPherson County. The test topped Mississippi lime at 2896 feet and penetrated the formation to 3425 feet. After obtaining a water shutoff, operators perforated casing with 32 shots at 2897-2910 feet. On first test, the well made an open flow of 3,000,000 feet. The test is 2½ miles from nearest production in the north end of Ritz-Canton, the section of the field that is chiefly productive of gas. Sporadic attention has been accorded this area as a trend play for the past six years, and although numerous shows have been encountered in the vicinity, the present is the first strike that might indicate a new structure.

Of possible importance to the northwest march of exploration is a wildcat stake in Thomas County. The location is about 45 miles south of the Nebraska line, some 60 miles west of production in Graham County, and on a problematical trend from Central Kansas Uplift. Alva Billings, Russell, Kansas, spudded Ryan 1, C E½ NE SE 27-8s-32w. Prior tests have been scattered in northwest Kansas, with no commercial production other than gas being picked up. A majority of the wildcats have had fair, although non-commercial, shows. Goodland sand, Kansas City-Lansing, Mississippi and Arbuckle limes, and Basal sands are the major prospective horizons.

Bradley Brothers et al's Davis 1, CWL SW S W32-23-12w, wildcat between Bedford and Stafford pools, Stafford County, picked up a show in Viola lime at 3804 feet. Hole was being bailed down.

## Forest City Basin

### *Arbuckle Lime Test Proves Disappointing*

The Nebraska campaign has its fourth test into Arbuckle lime, deepest prospective pay horizon. Three prior wells failed to obtain shows below Viola lime, and the outlook for production from lower strata has not been helped by the present test. Nemaha Development Company's Evans 1, CNW NE 32-5n-15e, five miles east of Auburn in the Nemaha-Richardson County play, although structuarlly higher than any previous well in Nemaha County, returned no encouraging shows. Formations cut were: Lansing 690-987 feet, Mississippi lime 1782-1960 feet, Hunton 2218 feet, Maquoketa 2905 feet, Viola lime at 2994 feet, St. Peter (Wilcox) 3387 feet, and Arbuckle 3427-3510 feet. A core in Viola lime, which many geologists regard as the lowest probable producing stratum, showed six feet of scattered porosity, no saturation.

Forest City basin exploration has prompted another try in Iowa. Johnson et al's Lucas 1, SW NE SE 28-70n-43w, Mills County, is a location.

Canfield and Sullivan were rigging up machine at Ragan 1, SW SW SE 19-10-20e, Jefferson County, in the Kansas sector of the Forest City basin, as another shallow test directly related to the general play. In Missouri, H. L. Scott's Smith 1, SE SE SE 24-55n-29w, is testing a show of gas at 400 feet.

# Oklahoma

### *Seminole Wildcat Shows Well; To Deepen*

A new Wilcox-sand pool for Oklahoma's Seminole area was indicated as Amerada Petroleum Corporation's Campbell 1, C N½ SW SW 30-9n-6e, Seminole County, swabbed 65 barrels of 43-gravity oil in five hours from Wilcox. The strike is a mile south of East Earlsboro and a mile west of Seminole. It will be deepened.

In Beckham County, Western Oklahoma, on the trend from Texas Panhandle oil and gas fields, seismograph parties are again active. Work is under way in the Erick-Sayre district for The Pure Oil Company. The County has four gas fields and one oil field. The region is on the west flank of the Anadarko basin. Past wildcatting has encountered numerous shows in lime, but with few exceptions commercial wells could not be completed.

In the Prague area of Lincoln County, where Skinner-sand production has recently been opened, H. L. Berkey's Gragg 2, NE SE SE 32-12-6e, at the north edge of production, topped sand at 3276 feet and drilled to 3299 feet. Following a 40-quart shot, it swabbed and flowed 461 barrels in 24 hours.

The Cromwell-sand play in the vicinity of Dill pool, Okfuskee County, has received impetus by Shell Oil Company's Curry 2, SE SW NW 35-12n-8e, which had pay from 3558 to 3607 feet. After a 20-quart shot, the well flowed 780 barrels of clean oil in 23 hours through casing.

Mid-Continent Petroleum Corporation has defined the north trend of production at Coyle pool, Payne County, with Johnson 3, C W½ SE 2-17-1e. Wilcox sand was topped at 4945 feet and drilled to 4947 feet to show only a scum of oil and salt water. Casing had been set at 4867 feet, and with the Wilcox showing water, operators plugged back to Hunton lime to perforate from 4623 to 4626 feet with ten shots. On initial flow, the test produced 115 barrels of oil and 1500 barrels of water.

In another try for Wilcox production in Logan County, Indian Territory Illuminating Oil Company has located Cronkite 1, NE SE NW 22-15n-4w, in the southwestern sector of the county. It will be carried to 7000 feet, or into Wilcox sand. A number of failures have been drilled, none of which, however, condmenn the present location.

In the same county, the second producer has been completed in the new Lovell zone. Danciger Oil and Refineries, Inc., Shore 1, C SW SE 34-18-4w, found sand at 4880-4903 feet, evidently the Layton, and oil began filling the hole. A prior well into this horizon proved it for gas production.

Gulf Oil Corporation is planning a deep test in northern Stephens County, with location probably in C E½ NE SW 3-2n-5w on a large block. The region has been seismographed.

### *Ohio Buys Out Pawnee Royalty in Forest City*

The Ohio Oil Company has purchased producing wells and acreage of Pawnee Royalty Company in Forest City Basin, southeastern Nebraska. The latter company brought in the Nebraska discovery in the Falls City area a year ago, and since that time has been active in developing the structure. The deal involves all production to date and approximately 65,000 acres of leases.

# North Texas

### *Wise Portion of Fort Worth Syncline Has Production*

First production for the Wise County portion of the Fort Worth Syncline was recorded when Britt Cranfill and C. E. Rodgers' McKay 1, 2 miles west of Park Springs, swabbed one 1 barrel of high-gravity oil per hour with rotary mud on preliminary test. Forty-quart nitro shot was scheduled to be used in the broken conglomerate pay at 5797-5852 feet, with hole bottomed at 5864 feet.

The Wise County prospect is 12 miles southeast of a wildcat producer in western Montague County. The test was financed through the sale of acreage to be paid for upon the completion of a producer, or 7500-foot depth contract. The original hole was carried to 6067 feet, then plugged back to side-track below 5020 feet because of parted drill pipe. No saturation was found in the Bend series below the 5860-foot level. Rotary mud remaining in the old hole and that absorbed by the formation was finding its way into the side-tracked hole, and considerable swabbing will be required to recover this fluid.

Walter Gant et al's Will Laird 1, 2¾ miles north of McKay 1 and in Montague County, lost rotary returns after perforating casing opposite oil saturation logged in the Strawn at 4865-4874 feet. Cement has been squeezed behind pipe preparatory to reperforating for another test. This wildcat yielded small volume of oil with mud on bailing and swabbing tests after perforating casing opposite Bend saturation at 6844-6860 and 5775-90 feet, with 7-inch pipe at 6641 feet, or 10 feet off bottom. Should the Strawn fail to produce, testing will be resumed in the Bend, topped at 5690 feet, or 140 feet lower than McKay 1.

W. B. Hamilton et al's Cartwright 22, third deep test for the Anarene shallow oil pool, Archer County, was awaiting production test after cementing 5-3/16-inch pipe at 5145 feet, with the hole bottomed at 5211 feet. Drill-stem test at 5149-64 feet yielded 90 feet of fluid in 30 minutes, including 50 percent oil and balance oil-cut mud.

Magnolia Petroleum Company's Parrish 15, southeast edge of the Hull-Silk field, was abandoned in dry Ellenburger at 5254-67 feet. Water was logged in Strawn at 4067-77 feet. Top of Bend was called at 4931 feet, and thin section of Mississippian was entered at 5226 feet. Gulf Oil Corporation's Siegel 24, near Bend production in the west portion of the field, logged top of Bend at 4581 feet, or 46 feet lower than the discovery, and has moved in spudder to dril plugs from 5½-inch pipe at 4577 feet. Hole is bottomed in hard lime at 4666 feet, with saturation recorded at 4634-46 feet. Helmerich & Payne, Inc.'s Wilmot 2, southeast corner of G. N. Smith Survey and twin location to a Strawn producer, was drilling at 3360 feet with the Bend as its objective. Adams Oil & Gas Company's Turbeville 1, eastern Archer County wildcat, logged Gunsight lime marker at 1017-21 feet, and was drilling at 3050 feet on a 5000-foot contract.

Completion of an Ellenburger producer for the southwest portion of the K-M-A field was assured when Magnolia Petroleum Company's Minnie Thom 4, near the Archer-Wichita County line, filled 4200 feet with pipe-line oil after drilling with machine to 4425 feet. Top of Ellenburger section and pay was called at 4398 feet, 22 feet higher than a deep pumper several locations southeast. Squib shot of nitro to be followed by acid treatment is slated for Thom 4.

Two tests in the Hapgood pool, eastern Clay County, proved dry in the discovery conglomerate pay, but deepening operations established production possibilities from a lower zone, as is the case in the Ringgold area. R. C. Lipscomb et al's Hapgood 1, short southeast outpost, cemented 7-inch pipe at 6077 feet after logging broken pay from this level to 6103 feet in Bend, topped at 5943 feet, or 18 feet low. The 5900-foot zone did not warrant testing. Three--minute drill-stem test at 6081-93 feet yielded gas blow with 70 feet of fluid, involving half oil and balance oil-cut mud. Phillips Petroleum Company's Hapgood 1, west offset to the discovery and 5 feet higher on the Bend, topped at 5890 feet, was drilling at 6190 feet in dry lime after passing up comparatively little saturation in the two zones. E. C. Norwood and King Oil Company's Hapgood 2, ¼ mile northeast extension, proved to be above the average Bend producer in gauging 784 barrels of oil natural in 8 hours through ¾-inch choke. Casing pressure ranged from 1300 to 1100 pounds, while tubing pressure dropped from 1210 to 550 pounds. Production is from conglomerate at 5966-81 feet followed by 2 feet of dry lime and conglomerate. Top of Bend was called at 5897 feet, or 6 feet lower than the discovery. The latter have moved rig one location east for Hapgood 3. E. C. Norwood et al's Shipley 1, northeastern Clay County wildcat and 6 miles northwest of Ringgold production, entered the Bend series at 5841 feet, and abandoned in Ellenburger at 5930-6002 feet. It was originally abandoned in August, 1939, at 5066½ feet. Comparatively thin section of Bend is not unusual on the north flank of the Bonita-Nocona-Ringgold conglomerate ridge.

Two outposts for the Ross-Jolly Bend lime area, eastern Clay County, have run pipe for production tests, although 100 feet or more low on structure. R. H. Dearing & Sons' Hatfield 1, 1 mile northwest of production, logged fair porosity and saturation at 5445-5500 feet in Bend, topped at 5449 feet. Petroleum Producers Company and Walter Gant's Ross 1, west outpost, was awaiting arrival of spudder to drill plugs from pipe at 5540 feet, with top of Bend called at 5516 feet, 120 feet lower than the nearest well.

The Texas Company's Hutchinson 1, projected deep test for the Delaware Bend faulted structure, northwestern Grayson County, cemented protection string of 9⅝-inch pipe near the 4500-foot level late last week. No geological markers have been released. Amon G. Carter et al's Allen 1, western Denton County 7000-foot project, was drilling shale at 5320 feet. J. G. Hammond, Inc.'s


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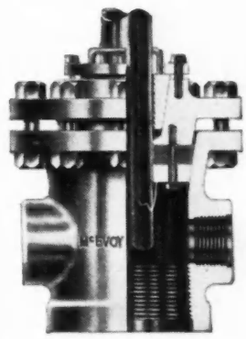


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Jester 1, 2 miles west of Mallard, Montague County, was drilling at 4780 feet, with the Bend as its objective.

Amerada Petroleum Corporation's Folley 1, south outpost for the Cisco sand sector of the Fargo pool, Wilbarger County, proved dry in this zone, and was drilling at 3510 feet, with the Canyon, Strawn and Ordovician beds remaining as prospectvie oil zones. Electrical formation survey used by Ramsey Petroleum Corporation prior to plugging its Lynch 1, Cottle County wildcat, listed top of Canyon at 4380 feet, thin section of Mississippian topped at 5405 feet, and Cambrian at 5503 feet. Solid granite was drilled at 5689-94 feet. The Cambrian has been reached by a few tests in north Wichita County.

# West Texas

## *Leases Let on North Acreage; Yoakum Test Seeks Deep Pay*

Two operators have acquired drilling rights along a 5-mile front immediately north of production in the Duggan-Slaughter field, northernmost producing area in West Texas. The assignment was made by Mallet Land & Cattle Company to expedite development, and the customary lease bonus was substituted by a sliding scale over-riding royalty interest.

L. C. Harrison et al were assigned lease on all of League 48, Edwards County School Lands, excepting Labors 5, 15, 16 and 25, involving an aggregate of 3750 acres. Flowing production was recently extended to within ½-mile of the south line of this lease block. Texas Canadian Oil Corporation, affiliated with Olivia Oil Corporation, a recent entrant in the Wasson field, acquired lease on all of League 47, Edwards County School Lands, excepting Labors 20 and 21, for an aggregate of 4100 acres. Two immediate tests will be required to offset flowing producers adjacent to the southwest corner of the lease. The company was also assigned lease on League 46, Edwards County School Lands, excepting Labor 5, an aggregate of 4280 acres and classed as wildcat.

Both deals involve drilling obligations, and the payment of one-eighth over-riding royalty until the cost of each well, which is not to exceed $32,500, is amortized, then the lessor is to receive one-quarter over-ride in addition to the customary one-eighth royalty interest.

Forest Development Corporation's Whisenant-Shell 1, Yoakum County semi-wildcat and 1⅓ miles northwest of production in the Waples-Plattner 2-well pool, was awaiting acid treatment to determine if commercial production is obtainable from a lower pay level. The recovery of one-half bailer of oil per trip was reported after perforating 5½-inch line with 120 shots opposite saturation in Permian at 5410-40 feet. The liner was cemented on bottom at 5515 feet to exclude water found at the 5300-foot level and below the producing level of the Waples-Plattner pool.

Cascade Petroleum Company's Walker 1, Southeastern Hockley County wildcat, cored water-bearing lime at 5077-82 feet, and may abandon.

Phillips Petroleum Company authorized two more tests to be drilled on short-term acreage held near its recently completed gasser on the Cowden-Embar ranch, Southern Andrews County, making a total of 5 starts in recent weeks. The new tests involve Cowden-Embar 1-22, C SE SE T&P Section 6, Block 44, T-1-N, and Cowden-Embar 1-123, C NE SW T&P Section 7, Block 44, T-2-N, both in Ector County. The company's Cowden-Embar 1-120, 1¾ miles southeast of the small gasser, failed to reach the anhydrite marker in drilling to 1705 feet, and was abandoned. Cowden-Embar 2, 4800 feet southeast of the discovery, was drilling at 2250 feet, having logged top of anhydrite at 1580 feet, or 192 feet low, while University-Andrews 1, northeast outpost, was drilling at 1650 feet. The latter reached the anhydrite at 1430 feet, or 1798 feet above sea level, being 47 feet low. Production possibilities below the regular Permian pay is believed the reason for the company's unusual drilling program, and is it desired to keep the lease block intact.

### Gaines Wildcat Has Show

Fred Postelle and Downey's James 1, Gaines County wildcat, was awaiting orders at 5253 feet after logging nominal saturation and porosity below 5073 feet.

The Seminole field, Gaines County, is one of the few important drilling areas in West Texas to register a gain in development in recent weeks. Amerada

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GARLOCK CHEVRON PACKING

Petroleum Corporation has 5 drilling, and 3 tests starting, while Magnolia Petroleum Company and Atlantic Refining Company, joint owners of 640-acre tracts, have 6 operations on the current report.

Development of the new Ordovician pool recently uncovered in Northern Pecos County by Taubert, McKee and Siemoneit's Crockett 1 may involve a number of immediate tests because of short-term leases. Magnolia Petroleum Company is the first to authorize a test, having cleared location for Markey 1, on 131-acre lease and a short distance northwest of the discovery. Heavy duty rotary formerly used in North Texas has been moved in for the initial test. The discovery exceeded earlier estimates on its flowing capacity in gauging 929 barrels of 43-gravity oil through ½-inch tubing choke in 11⅓ hours, with gas volume rated at 1,500,000 feet daily. Production is from Simpson sands at 5283-92 and 5320-40 feet.

Shallow oil strike in northern Pecos County was recorded when R. G. Pattillo et al's P. E. O'Neal 1, C S¼ of S¼ H&GN Section 74, Block 10, flowed 25 to 30 barrels of oil daily by heads through casing from Permian at 1645-58 feet. It is 2 miles northwest of the Apco pool, and is contracted to drill to the Ellenburger, or 5000 feet. In view of the performance of the well, it may be completed at the above depth, and rig skidded to fulfill the deep drilling contract.

In Presidio County, H. D. Wilcox et al's Jones-Coffield 2, H&TC Section 308, Block 4, has been completed as an artesian water well after plugging back from 2399 feet to 2375 feet. An analysis of the water is reported to have confirmed the presence of medicinal properties. Wilcox has been wildcatting in the general area for a number of years.

# Southwest Texas

## *Several New Sands Promise Extended Development Era*

New sands were being opened in several producing areas of the South Texas Gulf Coast to indicate a prolonged drilling program for the fields.

On the east flank of the Ben Bolt field of Jim Wells County and ½ mile from production, Earl Callaway took a 100-acre farmout from Henderson Coquat and drilled M. W. Smith 1, Share 3, to 5600 feet. On basis of side-wall samples, test was made of a sand section at 4863-75 feet and the well flowed several barrels of 30-gravity oil per hour through small choke. Gauge was being run.

Magnolia Petroleum Company's West 105-A, West Ranch field of Jackson County, was completed through perforations at 6104-10 feet and flowed 612 barrels of clean oil per day through ¼-inch choke. It opened the deepest producing level in the field, 350 feet below the former deepest sand. Several other wells have attempted completion at this level.

Wellington Oil Company's L. Ranch 1-A, in the eastern portion of the Lolita field, Jackson County, was at 6530 feet and preparing to plug back for completion. It indicated a new sand for the field at 5835-55 feet, 100 feet shallower than the discovery pay. The new level would be the fourth for the field. On a drill-stem test at 5843-55 feet, it recovered 290 feet of oil, 60 feet of oily mud with 40 pounds pressure in 10 minutes. It then cored the regular pay to find the customary sand section.

Texas Conservative Oil Company's Hattie E. Flinn 5-B, in the South Clara Driscoll field of Nueces County, drilled to 6000 feet, ran electric log and took side-wall cores which indicated two new sand lenses for the fields at 5820-30 and 5880-90 feet. Casing was perforated at 5820-26 feet, and the well flowed several barrels of oil per hour. A final gauge was being run.

About 4700 feet due north of the Shield field, Nueces County, Fred W. Shield and Allen & Morris' Gallagher & Allen 1 was being prepared for final completion, separator and tanks having been erected. The well flowed at the rate of about 75 barrels of 54-gravity oil or distillate per day through 5/64-inch choke under 2400 pounds working pressure, then built up to 2650 pounds when shut in.

Richardson Petroleum Company's 3000-foot easterly extension to the Agua Dulce field in Guaranty Title and Trust Company 1, flowed 165 barrels of 39.8-gravity pipe-line oil per day through ⅛-inch choke under 1750 pounds working pressure after perforations were made at 6889-95 feet.

### Pettus Trend

W. R. Davis & Company was completing a Cook Mountain-sand producer on the Weser prospect in Goliad County to give rise to possibilities of a new trend of development and exploration. The company had perforated at 5246-52 feet with 24 shots in W. F. Albrecht 1-B, and the well was flowing into pits making 40-gravity oil and wash water. No gauge was available. The test is in the Hancock Survey and is less than 1000 feet northwest of a test drilled on the same fee land by Steinberger Petroleum Corporation. The original test had made gas and distillate in the same sand, but a successful completion never was effected.

A new sand and 1-mile extension for the Thomaston field was provided as Atlantic Refining Company's W. E. Conwell 1 flowed 41.4 barrels of 31.2-gravity Wilcox oil per day through ¼- and ⅜-inch chokes under 240 pounds tubing and 380 pounds casing pressures, cutting 88 percent water. Gas/oil ratio was 10,024/1. The original producer on the structure was completed in a 7800-foot Wilcox sand as a condensate well.

Northeast 4/5 mile of the Washburn field discovery, La Salle County, H. R. Cullen's Washburn 2 was abandoned below 5500 feet. It had small oil showings in several Wilcox sands, but none were commercial.

### New Valley Area

Willacy County was promised a new oil field as Pan American Production Corporation's P. Garcia 1 was being completed in a 7600-foot Frio sand. The test was flowing several barrels of 32-gravity oil, salt and wash water and gas through ¼-inch choke under 750 pounds working pressure. Perforations had been made at 7652-80 feet. Location is in the San Juan de Carricios grant, six miles southeast of Willamar. The well was drilled on a farmout from the Shell Oil Company and Standard Oil Company of Texas. The three companies hold about 7000 acres in the block in addition to Pan American Production Corporation's holdings adjacent to the drilling block consisting of about 2150 acres. The test, drilled under contract by Trinity Drillers, Inc., was carried to 9003 feet, then plugged back, testing at several levels before the present one. The company staked Willamar Community Lease 1-B, 1015 feet south and slightly east of the prospective discovery.


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# Texas Gulf Coast

## *Fishers Reef Made District's Fourteenth 1940 Field*

Humble Oil & Refining Company made Fishers Reef the fourteenth 1940 discovery for the upper Texas Coast and set up the second entirely marine field for the sector by completing State 2-C-46, Trinity Bay, Chambers County, for 24 barrels of 32.6-gravity pipe-line oil via ¼-inch choke, on one-hour gauge. Flow was from Hackberry zone of the Lower Frio perforated at 8961-63 feet, registering 1500 pounds pressure on tubing. The test, which, was shut in prior to potential test, bottomed at 9005 feet, with 2½-inch tubing set 8843 feet. Frio was topped at 7565 feet, 35 feet higher than Standard Oil Company of Texas-Salt Dome Oil Corporation's State 61-54, May, 1940, failure 1½ miles west. The companies drilled another failure before discovery, as did Humble Oil & Refining Company. The prospect, 7 miles northeast of Cedar Point and 11 miles southwest of Anahuac, was one of a selected group of five structures found by pioneer torsion balance work on the bay and bay-shores. Of the others, Caplen, Cedar Point and South Cotton Lake have been converted, while Angleton Grove is partially condemned by a dry hole. The strike is the company's second, the first being Red Fish Reef, 12 miles southwest, in a hurried, expensive campaign to establish production on state leases to avert surrender in 1941-42. Company's A-3-248, a mile northeast of discovery at Red Fish Reef, was drilling at 10,419 feet; A-4-203, 1½ miles northwest discovery, was drilling at 8374 feet.

The new 8900-foot pay at Rowan, Brazoria County distillate field, in doubt for the past two weeks due to faulty completion of Texas Gulf Producing Company's Bradbury 1, appeared established as the test gauged 6 barrels distillate hourly via 7/32-inch bottom-hole choke and 10/32-inch top choke under 1700 pounds tubing pressure, 3000 pounds casing pressure, through 24 perforations at 8957-68 feet. Chokes were changed to 14/64-inch bottom-hole and 20/64-inch top for potential test while flow was turned to tanks. Initial tests at 8975-80 feet checked 7 barrels distillate hourly with 40 percent salt water, due to poor cement seal. Completion provides a 2200-foot east extension.

Extension attempts in three active 1940 Texas Coast discoveries were failures. In the Rowan field, Brazoria County, Texas, Gulf Producing Company abandoned Moore 1, 2000-foot west extension attempt, after finding salt water in both regular 8500-foot pay and semi-proven 8900-foot distillate horizon. Stanolind Oil & Gas Company quit Lobit 1, north outpost at Alta Loma, Galveston County, at 9342 feet. Company's Hulen 1, wild discovery well, cored the 9160-foot sand in side-tracked hole and was running casing. McDannald Oil Company abandoned Choates 1, 1200 feet northeast of production at Dyersdale, Harris County, at 4094 feet after finding salt water in the sand at 4074-84 feet, 15 feet lower than the producers. H. C. Cockburn's Burkett 4, northwest edge, failed to hold flow and will install gas lift.

Prospects for a shallow field at Dyersdale, north of Houston in Harris County, were enhanced by J. M. English's completion of Stewart et al 1, fifth well in the field. Test, offsetting discovery on north, flowed 300 barrels of 22-gravity oil daily through ¼-inch choke, showing slight fresh water cut, from Frio pay topped a few feet low at 4064 feet. H. C. Cockburn's Burkett 4, fourth well, failed to flow and was equipped with valves for gas lift. Cockburn's Burkett 8 was flowing into tanks and appeared to be a normal producer. McDannald Oil Company's Choatas 1, 1200 feet north of discovery, confirmed north dip by coring pay at 4073 feet. Electrolog of upper 5 feet of pay was not characteristic of producers, and the well was carried to 4094 feet and abandoned.

At Ogburn, northwest Harris County, L. M. Josey tested 3 new deep sands in Fee 1, 2500 feet northwest of the discovery, with results indicating that a third productive sand will be established for the field. Drill-stem test at 7130-40 feet recovered gas and amber distillate under high pressure. Drill-stem test at 7020-30 feet yielded 250 feet of 38-gravity oil and 250 feet of salt water. Test at 6967-73 feet recovered distillate and gas. The three sections were squeezed for test at 6935 feet, 40 feet below the sand section which corresponds to the 6900-foot production in the southeastern sector of the field. In all 12 sands will be tested, 8 of them for the first time in the area. The 6500-foot sand producing in W. L. Goldston's Josey 1, offset, was logged normal and will be tested after new sands at 6616 and 6654 feet. Completion will be the sixth for this 1940 Texas Coastal distillate strike, which took on new prominence with a recent 4000-foot south extension that flowed the first oil from the 6900-foot horizon. Mrs. Joyce Richardson and Christian Carpenter Drilling Company spudded Backen 1, Pan American Production Company farmout on south offset acreage to the discovery.

David B. McDaniel will re-enter Baldwin 1, Tamina area wildcat, Montgomery County, for reconditioning and retesting. The well, which has been standing for several months, showed oil in a 9300-foot Wilcox sand, but mechanical difficulties and lack of pressure prevented completion. McDaniel will drill a 10,000-foot test in the area, Baldwin 2, southeast of Baldwin 1.

Gulf Oil Corporation's Scanlan 5, southeast extension for portion of the North Thomas field, Fort Bend County, east of the Brazos River, made 810 barrels of 36.4-gravity oil daily through ¼-inch choke from Vicksburg pay, topped 7880 feet. Tubing pressure was 1300 pounds, casing pressure 1500 pounds. Company staked Scanlan 6, one location southeast of Scanlan 5.

F. Roensh has been blocking acreage 6 miles northwest of Bellville, Austin County, on 3 to 6 months geophysical option, according to unconfirmed report. Block is said to center in Lott Survey, with same rumor linking Atlantic Refining Company to the play.

## *Ask Special Tests for Chapel Hill Field*

Sun Oil Company and other operators in the Chapel Hill field, Smith County have requested a series of special tests to determine whether or not the field should be developed further.

At a hearing before the Texas Railroad Commission last week, the company asked for an allowable of 200 barrels daily, without shutdowns, which is in sharp contrast to the current allowable of 53.2 barrels for each of the three producing wells in the field. Production is found at 8200 feet, and the additional oil can be produced without physical waste, according to F. E. Heath, Sun Oil Companpy engineer. Pressure has declined from 3794 to 2788 pounds, from February 2 to November 6, 1940.

# East Texas

## *Wood County Test Fails to Improve With Deepening*

The southeastern Wood County wildcat of Bobby Manziel et al on the Morrison tract, Hawkins area, failed to materially increase its fluid level in deepening from 4925 to 4962 feet. Some doubt prevails as to whether the prospect has reached the main body of Woodbine sand, and it is due to be deepened this week. The small volume of low-gravity oil produced with salt water from sand, topped at 4907 feet with an elevation of 423 feet, is not sufficient to make a commercial well.

Owners of small leases and drilling sites within Humble Oil & Refining Company's large block of acreage, centering east and southeast of the Morrison test, have applied for numerous drilling permits as exceptions to well spacing rules. It is doubtful if any of these will be drilled until the area registers commercial production.

Production test of Frank Bryan and Farrell Drilling Company's Bevill 1, prospective lower Trinity wildcat producer for the Horn Hill faulted structure, Limestone County, will be delayed some weeks to perfect titles. Gulf Oil Corporation recently contracted to purchase Bryan's half interest in the well and site and full interest in about 6000 acres for a reported cash consideration of $150,000, with Bryan retaining an over-riding royalty interest. Core samples and electric log indicate production possibilities in the Pettit, topped at 4737 feet, and also in the Travis Peak sandstone at 4892-4937 feet. Pipe will likely be landed on top of the Pettit without making a drill-stem test, as originally planned.

R. H. & W. Oil Company's Saunders 1, Anderson County wildcat and on the east edge of the Frankston townsite, was credited with recording a high structural position in logging Pecan Chalk at 3390-3435 feet, with an elevation of 431 feet. The test was drilling at 3790 feet.

## *Francitas Hearing*

Hearing on the application of British American Oil Producing Company for an increase in the allowable for the Francitas field, Jackson County, has been postponed indefinitely by the Texas Railroad Commission. The action was taken at the request of the applicants.

# Louisiana Gulf Coast

## *District's Fourteenth 1940 Field Indicated in Jefferson*

The State Conservation department refused to permit Titanic Oil Company to complete Marrero Land Company 1, Jefferson Parish wildcat, through drill stem, claiming violation of regulation specifying 5½-inch casing as minimum for flow string, but appeared that the test will eventually open South Louisiana's fourteenth new field for 1940. The well was estimated good for 450 barrels daily after short test through opened pipe recovered 35.1-gravity oil through 9/64-inch choke. Pressure rose from 1300 to 3300 pounds. Operators killed, and will cut and pull drill pipe which was cemented in with intention of perforating stem for completion. The wildcat, Section 2-13s-23e, on Gretna prospect blew gas and distillate under 1800 pounds pressure from 9843 feet after coring oil sands at 9896-9925 feet. Drill pipe was stuck by the blowout. Acreage is a farmout from Shell Oil Company, who with Gulf Refining Company and Stanolind Oil & Gas Company, blockholders, contributed $27,000 to the test.

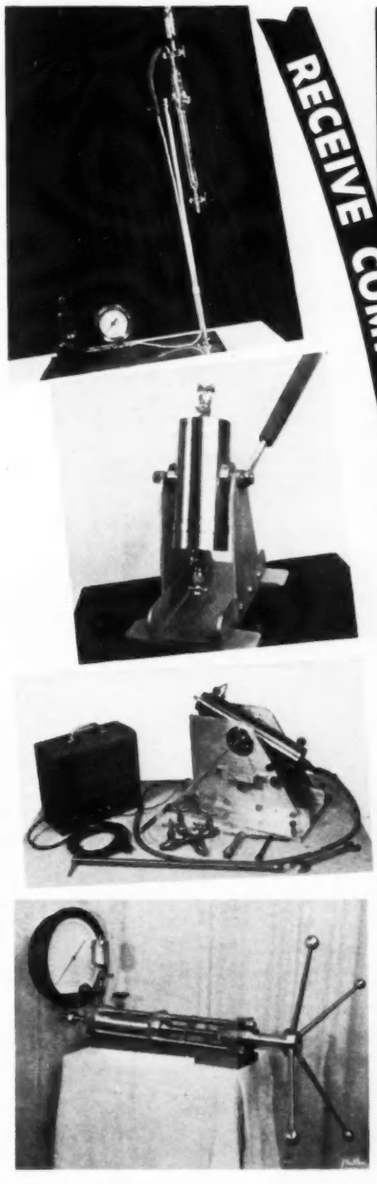
An expected new field for St. Mary Parish did not materialize as Bateman Drilling Company's Foster 1, Section 38-15s-9e, Franklin area, tested salt water and mud from perforations 10,402-10,416 feet. Previous set of perforations in same zone also failed to produce. Oil sands were cored at 9350-58 feet, 9750-9781 feet, 10,345-355 feet, 10,380-390 feet, 10,400-420 feet, and 10,425-430 feet. A gas sand was logged 10,461-466 feet. Saturation in several zones varied from 5 to 8 percent, and porosity from 27 to 30 percent. Test checked 500 feet high on regional normal, with a scarcity of previous tests in the area bounded by West Cote Blanche Bay, Wax Lake, Franklin, and Bayou Sales lending added interest.

Two 8200-foot-objective Iowa field wells have failed to report the pay to indicate limits of the prolific, recently-opened horizon which may not exceed the bounds of shallow production. Shell Oil Company's Heyd 32 was near 9200 feet after drill-stem test in the 8200-foot sand was disappointing. Albert Glassell's Bowman 1, northwest edge well, was 700 feet below the pay and had made no test. Magnolia Petroleum Company's Waite 15, workover, seemed a sure producer as it waited on cement after coring pay at 8234 feet. Company's Waite 16, new hole, was under way, as were Barnsdall Oil Company's Fontenot 4 and Shell Oil Company's Fontenot 4, workovers on the Jefferson Davis Parish side of the field. Sid Richardson's Sweet Lake Land & Oil Company 1, 2000-foot south extension attempt and first well out of the boundaries of shallow production, was closely watched as it drilled near the pay.

By available records, it appears that Sun Oil Company established a new deep sand in the Chacahoula field, La-Fourche Parish, by completing Williams-Cypress 2, northeast flank, at 9330-60 feet for 16 barrels of distillate and 3,600,000 feet of gas daily through 3/16-inch choke, with tubing pressure 3900 pounds, casing pressure 2800 pounds. The operation, one of the most prolonged in the coastal district, was spudded last April. Several sands were tested total depth of 9569 feet, one at 8332-36 feet swabbing oil. Previous production was from Miocene sands between 7000 and 7250 feet.

W. T. Burton and Continental Oil Company have recovered all but a little of 1100 feet of drill stem stuck in Mayo Realty Company 1, wildcat in Section 11-8s-8w, South Lake Charles prospect, Calcasieu Parish, by blowout a week ago. The fishing operation was slowed by imminence of a third blowout from around 10,800 feet. While no electrologging has been done in the lower part of the hole, extreme pressures and distillate found by coring and stem-testing at 10,852-871 feet indicate the test has an excellent chance for production.

Ultimate importance of the Neale field, Beauregard Parish, depends upon Atlantic Refining Company's ability to make a well of Rice Land & Lumber Company C-1, 1½-mile west outpost. On drill-stem test of the regular Wilcox pay, cored at 8345-60 feet, level with producers, tubing filled with oil with 30 percent salt water cut in 9 hours. This 1940 discovery has attracted much attention because of the apparent absence of structural relief on all sides except the east, and moderate dip close to the discovery on the west. If the current west outpost makes a well, the field will be tentatively conceded to be the most

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important South Louisiana discovery of the past two years. The company's Musser-Davis 3, inside well, gauged 250 barrels daily through 3/16-inch choke, while Musser-Davis 4 was fishing for part of drill-stem tester.

Mulvey Irrigation Company 2, Fohs Oil Company's closely watched south flank test at Gueydan, Vermilion Parish, spudded, set conductor pipe at 170 feet, and shut down because of high water. The test, Section 34-11s-1w, is 640 feet southwest of Mulvey Irrigation Company 1, 3800-foot southwest extension which flowed 1,700,000 feet of gas and 25 barrels of distillate daily from 9248-54 feet to establish a new flank gas sand which operators believe will yield commercial distillate in the second test.

**West Lake Verrett New Pay?**

There was yet no information upon whether Shell Oil Company's St. Martin Parish School Board 1, Section 16-4s-12e, minor extension for West Lake Verrett field, St. Martin Parish, was flowing from a new sand, as has been rumored. Footages were withheld, the report giving only a potential of 235 barrels through 13/64-inch choke.

Superior Oil Company again drilled into salt in State 4, Lake Calcasieu dome wildcat, Cameron Parish, this time at 7867 feet, and plugged back to redeviate. Test previously encountered salt at a shallower depth, plugged, and deviated. Location is 640 feet northeast of State 3, 13,610-foot depth record for the Gulf Coast and fifth 13,000-foot hole for South Louisiana.

Union Sulphur Company will attempt to confirm the China-Fenton field, latest discovery on the Louisiana coast, with Latrielle Estate 1, Section 12-8s-4w, Jefferson Davis Parish, 1000 feet south of Calcasieu National Bank 1-A, discovery, which flowed distillate from 9280-9300 feet. Superior Oil Company staked a 2000-foot southeast extension to the University field, East Baton Rouge Parish, McGivney 1, Section 46-7s-1e. H. C. Cockburn and F. W. D. Oil Company spudded Ganionelli Estate 1, wildcat 7 miles southeast of the field, which Frank Dayvault, contractor, will carry to 8500 feet. F. W. D. Oil Company recently abandoned Hart & Aldrich 1, 3 miles southwest of the field, at 7501 feet.

W. C. Snowden found no oil in the upper 2000 feet of Wilcox and abandoned Fee 1, wildcat in the Lake Latagnier area, Section 22-3n-5e, Avoyelles Parish, at 7210 feet. J. C. Chance abandoned location for Industrial Lumber Company 1, Big Woods wildcat in Section 25-8s-12w, Calcasieu Parish, while W. B. Hamilton quit Amy 1, Eunice area wildcat in Evangeline Parish, at 8025 feet.

Geophysical activity continued at a steady pace. Shell Oil Company had seismograph crew in Townships 13s and 14s-13e, Assumption Parish. Phillips & Rutledge had crew in Livingston Parish, Townships 8s-7e and 7s-7e. In St. Bernard Parish, The California Company had shooting crew in the Shell Beach area, Township 13s-16e. Republic Production Company worked a gravimeter crew in Tangipahoa Parish, Townships 1, 2, 3, and 4s-7 and 8e. In Allen Parish, Atlantic Refining Company had a seismograph in Township 3s-6w. Humble Oil & Refining Company was shooting in Township 5s-7w, while Sun Oil Company was working two crews, Townships 7s-12w and 6s-11w, Beauregard Parish. Union Sulphur Company had refraction crew in Township 8s-1w, Acadia Parish, and another crew in Holmwood area, Township 11s-7w, Calcasieu Parish. Continental Oil Company and Atlantic Refining Company had shooting crews in St. Landry Parish, former in Township 4s-4e, latter in Township 3s-6e. In Cameron Parish, Amerada Petroleum Corporation worked the Miami Corporation lands, Township 13s-8w. In Terrebonne Parish, Stanolind Oil & Gas Company shot Township 18s-13e, Phillips Petroleum Company worked Townships 19 and 20s-18 and 19e. Gulf Refining Company worked the Delacroix area, Townships 15s-14 and 15e, Plaquemines Parish. In same parish The California Company ran gravity survey, Townships 14 and 15s-23 and 24e, with another gravimeter in Townships 16s-16 and 17e.

## North Louisiana

### *Lower Marine East Limits Defined at Cotton Valley*

The eastern limits of lower Marine production in the deep Cotton Valley field, Webster Parish, were defined last week when Mid-States Oil Corporation's Gaines-Giddens 1, S WNE 30-21n-9w, was abandoned as a salt-water hole at 8680 feet, in the lower Marine. Three efforts were made to complete this well in the lower Marine, but salt water showed each time. With elevation of 237 feet, it topped lower Marine (Cotton Valley) at 8122 feet, and Bodcaw (the "E" sand) of the same horizon at 8649 feet. Casing was first perforated at 8649-69 feet with 117 shots, and salt water showed. Later, casing was reperforated with 60 shots at 8649-56 feet, and it showed 100 barrels of salt water daily. On the third attempt at 8663-69 feet, with 40 shots, the well showed 10 barrells of salt water per hour.

Two deep tests proved disappointing. Continental Oil Company abandoned Tensas Delta 1, C N½ SW SW 12-9n-7e, Catahoula Parish wildcat, at 9215 feet. The test topped Wilcox at 3101 feet, elevation 61 feet. Location was adjacent to the Angelina-Caldwell Flexure and was important geologically due to increased interest in the trend along this flexure shown since discovery of shallow Wilcox oil production at Olla and Nebo (Jena), both in La Salle Parish. The Ohio Oil Company shut down and probably will abandon at 11,270 feet its deep test in the shallow Haynesville field, Claiborne Parish. The test, G. W. Taylor 15, Account 1, NW SW 15-23n-8w, had electric log run to present depth. Top of Buckner was 10,550 feet. A slight gas showing was logged at 10,970 feet in lime. Former production at Haynesville is from the 2800-foot Blossom (Ozan), with a few wells producing at 4200 feet. Haynesville is a tilted dome structure.

The Olla field, La Salle Parish, has definitely taken the lead in North Louisiana away from the old shallow Pine Island field, Caddo Parish, which for the last two years has led North Louisi-


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ana activity, due to drilling of wells to the 1500-1600-foot chalk horizon. Last week Pine Island added only one producer while Olla accounted for five producers.

Deepest active drilling operation in North Louisiana is Union Producing Company's Meadows A-1 C NE 18-21n-4w, Claiborne Parish, two miles north of Lisbon production, which drilled sand with streaks of shale at 9316 feet in lower Marine. This test had a slight oil showing at 8964-67 feet, but missed a drill-stem test.

H. L. Hunt's Goodpine A-4, C NE SW 9-7n-3e, fourth test for the Nebo field, La Salle Parish, waited on cement after perforations were squeezed off at 3760-66 feet. The well showed 108 barrels of fluid daily, 80 percent salt water. Hunt is rigging another test in the same area.

## Arkansas

### *Twenty-First Well Looms for Buckner Smackover Feld*

What may be the twenty-first oil well for the Buckner field, Columbia and Lafayette Counties, oldest of the Smackover deep-lime oil producing districts in South Arkansas, was testing last week. It is Scott Hammond's S. T. Crone 2, SW NE 9-16-22, second well on a "farmout" from Louark Producing Company, which topped Buckner at 7046 feet, Smackover lime at 7301 feet, and four feet below that point picked up saturation. Casing, 5½-inch, was set at 7300 feet, 15 feet off bottom.

In the Dorcheat field, Columbia County, Lion Oil Refining Company's Dickens Unit 1, C NW SW 16-18-22, northeast offset to this field's only failure, ran final casing string for production test. With elevation of 223 feet, it topped porosity at 8825 feet. Total depth is 8940 feet.

## Mississippi

### *Single Wildcat Among Week's New Starts*

New wildcat activity continued at a low ebb in Mississippi, only one new wildcat location being announced. This was Fohs Oil Company's Batson-Hatten 1, SE 10-1s-12w, Forrest County. An 8000-foot test is planned, on a block of 70,000 acres. It is the company's second deep wildcat for this part of Southern Mississippi, a recent wildcat in Stone County, near Maxie, having been abandoned.

W. O. Allen, Oklahoma City, abandoned a wildcat in Warren County, Tom Henry 1, C W½ SW 4-7n-4w, at 7277 feet, in Eutaw. Top of Eutaw sand, which was slightly salty, was logged at 7250 feet, elevation 281 feet.

### *East Texas Pressure Drop*

A drop of 1.92 pounds in the average bottom hole pressure for the East Texas oil field was reported last week by the Texas Railroad Commission. The average pressure on November 8 had declined to 1057.76 pounds.

## Rocky Mountain Area

### *New Starts at High Level Despite Sub-Zero Cold*

First sub-zero temperatures of the season failed to cool the drilling pick-up in the Rocky Mountain territory as operators continued to start new wells, presaging a heavy increase in drilling operations for the district in the spring. Four new wildcat locations were made, two of which were in Wyoming, one in Colorado and one in Montana. In addition, 13 new starts were reported for the field areas.

Completion of Continental Oil Company's Prigge 1, SE SE SE 33-9s-25e, for 124 barrels of oil initial, extended the Frannie field ¾ mile north and west, and opened a new producing district for Montana. It is the first well drilled on the Montana side of the state line, with the field lying principally in Park County, Northwestern Wyoming.

Montana producing fields are still endeavoring to boost output to current market demands. Continued heavy market requirements for the fields in this state during the past summer have completely depleted available storage, and is still ahead of production, making it impossible for operators to replace the stocks in anticipation of summer increases. Current production for the state is around 556,800 barrels per month, while demand approximates 722,600 barrels.


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# Michigan

### *Clare Wildcat Yields 115 Barrels After Treatment*

Rowmor Corporation and Dan Hughes' Wyman 1, SW SE 29-20n-6w, Clare County, swabbed and flowed 115 barrels first 24 hours after acid treatment to hold promise for a commercial well and pool opener. One of several wildcats drilled in 1939-40 in attempts to pick up closure on a northwest extension of the Temple structure, it logged Dundee dolomite at 3758 feet, setting it 47 feet higher than the closest correlating well. It bottomed at 3762½ feet with 2000 feet of oil in 5-inch casing over a 22-hour period. It flowed 79 barrels net first three hours after acid, and flowed only after swab agitation since.

Operators announced intentions to pull tubing and drill deeper. Wyman 1 well is three miles west of Sun Oil Company's State A1, Section 35-20n-6w, completed for a 45-barrel pumper two months ago in the Dundee dolomite. State A1 was never treated because of fears of water encroachment, oil cuttings from 2 to 10 percent at the present time.

With small and large operators having checkerboard leases in the district, final completion for any substantial production probably would kick off an active drilling campaign. Despite several promising starts, the basin has failed to produce a single important new pool discovery since 1938.

Gulf Refining Company's Bateson 1, SE SE 2-14n-4e, Bay County, projected 9000- to 10,000-foot Trenton and St. Peters test, was drilling at 7390 feet in broken Salina shale, dolomite and lime. At 6675 feet, the company established a new Michigan depth record. The old mark of 6674 feet was set in 1935 with a cable-tool operation in Newaygo County.

While 2500 feet shallower than Bateson 1, Sun Oil Company's Kidder 1, Section 8-3n-9w, Barry County wildcat, set a depth mark for 1940 in southwestern Michigan where 1200- to 1900-foot holes predominate. The company was drilling below 4885 feet, with Trenton logged back at 4387 feet. No promising saturation zones had been logged in the Trenton.

Sun Oil Company's Goodwin 1, SE NE NW 36-17n-2w, Beaverton Township, 1320 feet west of Drury's Yager 1 producer, swabbed 64-38-47 barrels on successive days natural from Dundee at 3850 feet. It will be acidized. Drury's Cingaon 3, 660 feet south of the Yager well, swabbed 20 barrels at 3859 feet. While neither of the two tests matched Yager 1, with an initial of 800 barrels and still flowing natural 340 barrels daily, more drilling appears assured in the old South Beaverton pool.

#### Maniste Wildcat Dry in Traverse

W. P. Shoemaker's Rogers 1, Section 34-23n-16w, Manistee County wildcat, shut down at 1590 feet after drilling Traverse dry. It probably will be carried into Dundee.

Rigs were being moved in for two new basin wildcats. Gulf Refining Company has a rig on Garber 1, C W½ SW SW 8-21n-1e, Ogemaw County, and C. L. Maguire, Inc. moved in rig on Cross 1, NW SW NE 33-16n-2w, Midland County.

First follow up development to Weber Oil Company's Gabel 1, 31-18n-10w, Osceola County discovery, was started by Taggart Brothers Company on Cornell 55, SW SE SE 30-18n-10w, a mile northwest of the producer. The company is primarily interested in shallow gas, 1300-1700 feet, and if test is structurally favorable, Weber Oil Company will deepen it to lower formations. Gabel 1 is pumping from 25 to 34 barrels per day from Monroe lime at 3635 feet.

With the first four follow-up starts in Bloomfield Township, Huron County, dry in the shallow Traverse lime zone, interest this week was building up for the deeper Monroe formation. In the most unique play of the year, Bloomfield Township attracted 10 rigs within 10 days after Cryden Oil Company's McDonald 1, 20-17n-14e, flowed 115 barrels first 24 hours from Traverse at 1425-27 feet. It was drilled in before a producing string had been run. An extended fishing job delayed completion for several weeks and the well quit flowing completely within a week. Attempts to return it to production have failed, and it recently showed about 8 barrels of oil to 32 barrels of water on a 12-hour pump test. Operators have temporarily abandoned the test. Whether it will be plugged probably will depend on deepening programs under way a mile south by Gordon Oil Company. The company's Gainor 1, Section 28, was dry in both the Traverse at 1416 and the Dundee at 2070 feet, and was being carried to the 2600-foot Monroe zone.

Daily Crude Oil Company's Powell 1, NE NW NW 5-7n-13w, Ottawa County, checked Berea at 1170 feet, and bottomed at 1185 feet with oil saturation. After a 40-quart shot, it flowed 41 barrels and went dead. It averaged 24 barrels a day over the next 72 hours on swab, and may be deepened to Traverse lime, original objective. Powell 1 is a wildcat six miles northwest of the Grand Rapids Traverse lime oil field. There is only one important Berea oil pool (Birch Run Township, Saginaw County) in the state, but the formation is a gas producer in several districts of Western Michigan, including the Grand Rapids field. Several wells in the Grand Rapids pool drilled enough Berea oil to warrant temporary production.

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IN SAN ANTONIO, TEXAS!
You'll Receive a "Gusher Welcome"
**Attractive Rooms** • **Superior Service**
WE OPERATE OUR OWN GARAGE
Tom L. Powell, Manager

# California

### *Domengine Sand to Be Tested In Pyramid Hills Well*

In the Pyramid Hills area of Kings County, Tide Water Associated Oil Company was preparing to test Domengine sand streaks topped at 1840 feet in West Slope 31, Section 20-24-18. Test is bottomed at 1970 feet and streaks of oil sand were encountered between 1022 and 1040 feet, with poor oil sand grading into gray sand encountered from 1100 to 1185 feet. Base of the gray sand was placed at 1220 feet.

In the northwest extension area at Signal Hill, Hilldon Oil Company deepened and improved the outlook for Flood Control 4. Deepened to 4550 feet, and gun-perforated from 4065 feet to bottom, it was placed on pump to make from 12 to 25 barrels daily of 28-gravity oil, cutting between 10 and 50 percent. The test is still being worked.

Tex Harvey Oil Corporation was planning to run formation tester on Gilmore Community 1, Section 11-32-14, Huasna area, San Luis Obispo County. Bottomed at 3682 feet in shale showing oil on ditch, an interval 3550 feet to bottom will be tested.

Shell Oil Company has completed KCL-A 25-28, in the Ten Sections field of Kern County, flowing on potential test 1591 barrels daily of 32.6-gravity oil, cutting 1.5 percent mud, and 1,264,000 feet of gas. Flow pressure on tubing was 110 pounds, casing pressure 1080 pounds. In the Ventura Avenue field, Ventura County, the company's Taylor 125 was placed on production from 7190 feet, flowing 1238 barrels daily of 31-gravity oil cutting 3 percent mud and 3,200,000 feet of gas. The company is currently operating eight drilling strings in various California fields.

### *Arkansas Permits*

Two drilling permits were issued last week by the Arkansas Oil & Gas Commission, both in Union County: McCresslen Oil Company's Hadley 4, SEc NE SW 3-18-13; and Marine Oil Company's Thompson B-8, NE SE SW 3-18-13.

# UNITED STATES WELL COMPLETIONS

## California

**Fresno County (Coalinga Northeast)—**

| Company, Well and Location | Init. Prod. Bbls. | Depth |
|---|---|---|
| Petrol Corp., 43-30B | 162 | 8288 |

**Fresno County (East Coalinga Eocene)—**

| | | |
|---|---|---|
| Standard, 3-17F | 2413 | 8135 |

**Fresno County (Jacalitos Hills)—**

| | | |
|---|---|---|
| Continental, Kreyenhagen 1 | * | 11020 |

**Kern County (Coles Levee)—**

| | | |
|---|---|---|
| Richfield, KCL-A 32-33 | 1925 | 9135 |

**Kern County (Edison)**

| | | |
|---|---|---|
| Wood-Callahan Oil Co., Lubold 1 | * | 3625 |

**Kern County (Greeley)—**

| | | |
|---|---|---|
| Standard, KCL 12-12 | 1884 | 11510 |

**Kern County (Kern River)—**

| | | |
|---|---|---|
| Hope Oil Co., Gray 4 | 20 | 1000 |

**Kern County (Round Mountain)—**

| | | |
|---|---|---|
| Trico O. & G. Co., Westco 1-A | 140 | 1452 |

**Kern County (Ten Sections)—**

| | | |
|---|---|---|
| Shell, KCL A-25-28 | 1653 | 8220 |

**Los Angeles County (Rosecrans-Athens)—**

| | | |
|---|---|---|
| Thos. Kelly & Sons, McMillen 4 | 71 | 7808 |

**Los Angeles County (Wilmington)—**

| | | |
|---|---|---|
| General Pet., H. C. 20 | 163 | 4040 |
| Union Pacific, UP 160 | 901 | 2956 |
| D. D. Dunlap Oil Co., W-6 | 75 | 3475 |

**Orange County (East Coyote)—**

| | | |
|---|---|---|
| Metro Pet. Co., Robertson 10 | 75 | 4260 |

**Orange County (Huntington Beach)—**

| | | |
|---|---|---|
| H. R. O. Oil Co., No. 1 | 30 | 4785 |

**Santa Barbara County (Santa Maria Valley)—**

| | | |
|---|---|---|
| Union, Bradley Lands 2-1 | 110 | 5070 |

**Ventura County (Ventura Avenue)—**

| | | |
|---|---|---|
| Shell, Taylor 125 | 1328 | 7190 |

**Ventura County (Oxnard)—**

| | | |
|---|---|---|
| E. A. Bender, Farrell 1 | * | 1010 |

## Illinois

**Bond County—**

| | | |
|---|---|---|
| National Pet., Spindler 8, sw se sw nw 10-6n-2w | 62 | 1016 |
| Shell, Dunnigan 1, sw nw se 21-6n-2w | * | 1181 |

**Clay County—**

| | | |
|---|---|---|
| Pure, Mosley 1, w ½ nw nw 3-2n-8e | 81 | 2614 |
| J. W. Sanders, Gill 1, ne se nw 18-2n-8e | 35 | 2760 |

**Clinton County—**

| | | |
|---|---|---|
| Williams et al, Dunn 4, nw nw ne 1-1n-1w | 24 | 1344 |
| W. P. Ford, Knolhoff 1, sw se ne sw 2-1n-2w | 20 | 1328 |
| Arcadia Royalty, Monken 1, swc nw 11-1n-2w | 32 | 1189 |
| Thompson Dr. Co., Knolhoff 1, nw sw 11-1n-2w | 15 | 1196 |
| Kagey, Ripley 1, ne nw sw 33-1n-2w | * | 903 |
| Harry Schwartz, Schafly 1, se ne se 3-2n-3w | * | 3530 |
| Mudge Oil Co., Jansen 1, ne se sw 14-3n-1w | * | 1771 |
| M. Siegel, Hite 1, ne ne 15-3n-3w | * | 604 |

**Edwards County—**

| | | |
|---|---|---|
| Noah & Morrison, Horton 1, ne sw se 13-2s-10e | 433 | 3200 |
| Tuesday Oil Co., Horton 1, se nw se 13-2s-10e | 211 | 3228 |
| Superior, Fewkes 1, se nw ne nw 18-2s-11e | 610 | 3204 |

**Effingham County—**

| | | |
|---|---|---|
| Blue Bell Oil Co., Kyle 1, nw sw nw 17-8n-6e | * | 900 |

**Fayette County—**

| | | |
|---|---|---|
| H. F. Dunn, McCann 3, se nw se 30-8n-3e | 96 | 1483 |
| Carter, Anderson 1, se ne sw 35-9n-3e | 5 | 1538 |
| Botterbusch 3, se se ne 30-8n-3e | 96 | 1483 |
| Graves 1, nw sw sw 24-8n-3e | * | 1522 |
| Beck 3, sw sw sw 16-8n-3e | 108 | 1569 |
| St. Pierre 3, se ne nw 1-8n-3e | 48 | 1532 |
| McCormick 15, sw nw se 18-7n-3e | 72 | 1594 |
| Magnolia, Clow 23, sw se nw 5-7n-3e | 340 | 1543 |
| Minerva, Bail 2, sec sw se 16-7n-3e | 101 | 1578 |

**Franklin County—**

| | | |
|---|---|---|
| Benedum-Trees, Sheppard-Martin 1, se ne se 27-7s-4e | 375 | 3155 |

**Gallatin County—**

| | | |
|---|---|---|
| Exchange Oil, Evans 1, ne ne nw 20-8s-8e | * | 3042 |

**Hamilton County—**

| | | |
|---|---|---|
| Exchange, Stelle 1, sw nw se 27-5e-6e | 260 | 2972 |
| Friel 5, se se nw 34-5s-6e | 40 | 2995 |
| W. C. McBride, York 2, sec ne 34-5s-6e | 85 | 2957 |
| Texas, Edwards 1, nw ne ne 3-6s-6e | 262 | 2946 |
| Cameron, Wilson 2, se sw ne 6-6s-7e | 85 | 2716 |
| Buell et al, Porter 1, nw ne se 30-6s-7e | * | 3307 |

**Jasper County—**

| | | |
|---|---|---|
| Pure, Adams 1, w½ nw ne 20-5n-10e | 1126 | 2815 |
| Murvin 2, nw nw sw 16-6n-10e | 1310 | 2794 |

**Jefferson County—**

| | | |
|---|---|---|
| Redwine et al, Ray 1, sw sw se 9-1s-2e | 65 | 1936 |

**Macon County—**

| | | |
|---|---|---|
| Gulf, Hight 1, nw nw nw 14-14n-2e | * | 1636 |

**Marion County—**

| | | |
|---|---|---|
| Texas, Parker 14, sw nw se se 28-2n-2e | 100 | 2045 |
| Richardson 17, nec se 5-1n-2e | 267 | 3502 |
| Ohio, Murray 1, ne sw nw se 7-1n-2e | SW dis | 1437 |
| J. J. Deaner, Burge 6, nw ne nw ne 18-1n-2e | 4 | 1874 |

**Monroe County—**

| | | |
|---|---|---|
| Regent, Gummershimer 1, sw 2-2s-10w | 30 | 470 |

**Montgomery County—**

| | | |
|---|---|---|
| Ed Solomon, Carroll 1, ne nw sw ne 3-8n-5w | * | 774 |

**Richland County—**

| | | |
|---|---|---|
| Illinois Prod. Corp., Spotswood 1, n½ sw sw 1-2n-10e | * | 3398 |
| C. O. Baldwin, Brasheir 1, sw sw nw 24-4n-9e | 80 | 2599 |
| Pure, Rinehart 1, cs½ sw nw 33-4n-9e | 33 | 3005 |
| Rose 1, cw½ se nw 7-4n-10e | 344 | 2928 |

**Shelby County—**

| | | |
|---|---|---|
| Paul Doran, Yakey-Gallagher 1, sw se nw 33-10n-4e | * | 2005 |

**St. Clair County—**

| | | |
|---|---|---|
| Sklar Oil Co., Dyroff 35, se sw ne se 28-1n-10w | 170 | 422 |
| Young, Schalle r1, nwc ne nw 10-3s-7w | * | 1910 |

**Wabash County—**

| | | |
|---|---|---|
| R. B. Martin, Pixley 1, nec se se 7-1n-12w | * | 1550 |
| Wabash County Oil Co., Hahn 1, sw ne sw nw 8-1n-12w | 125 | 1550 |
| Leighty et al, Tremble 1, se se ne 35-2n-12w | * | 1450 |
| Big Chief, Seibert 4, nw ne sw 34-2n-13w | 40 | 2676 |
| Pure, Douthit Cons. 1, cw½ sw se 29-2n-8e | 757 | 3115 |
| Hubbell 7, c w½ sw ne 32-2n-8e | 760 | 3112 |
| Tide Water et al, Steckler 1, sw sw nw 26-1s-13w | 55 | 2595 |

**Washington County—**

| | | |
|---|---|---|
| Leo Horton, Bielatowitz 3-B, se se sw 23-3s-3w | 50 | 1272 |

**Wayne County—**

| | | |
|---|---|---|
| Robinson et al, Felix 3, ne sw sw 26-2s-8e | 139 | 3400 |
| Humphreys, Brock 1 se nw 4-2s-7e | 46 | 3293 |
| Albright et al, Collins 1, nw nw se 24-1s-9e | * | 2514 |
| Pure, Barth-Hubble Cons. 1, ne ne ne 5-1n-8e | * | 3130 |
| Feller 2, sw nw ne sw 5-1n-8e | 426 | 3100 |

**White County—**

| | | |
|---|---|---|
| W. W. Gray, Fee 5, sec sw se 14-3s-14w | 211 | 2506 |
| Arrow Dr. Co. et al, Hon. 1, sw ne sw 33-3s-14w | 228 | 2900 |
| Cornwell et al, Felix 2, se ne 19-3s-8e | 170 | 3232 |
| Ben Nation et al, Painter 1, n½ ne ne se 19-3s-8e | 168 | 3255 |
| Dunn 2, sw nw nw 6-4s-8e | 105 | 3390 |

[*Continued on next page*]

*Failures; †Junked; ¶Million cu. ft. gas.

## Summary of Drilling Operations in the United States, Week Ended November 16, 1940

| | WELLS COMPLETED | | | | | | | *PERMITS FOR NEW WELLS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Completions | Oil Wells | Gas Wells | Failures | Initial Production | Total 1940 | Total this Date 1939 | This Week | Total this Month | Total 1940 | Total this Date 1939 | Year Total 1939 |
| Alabama | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arizona | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Arkansas | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 6 | 135 | 203 | 223 |
| California | 18 | 16 | ..... | 2 | 10,950 | 993 | 959 | 20 | 35 | 996 | 989 | 1,174 |
| Colorado | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Florida | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Georgia | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Illinois* | 84 | 64 | ..... | 20 | 11,597 | 3,564 | 3,377 | 124 | 178 | 4,066 | 371 | 893 |
| Indiana | 20 | 13 | 1 | 6 | 1,850 | 463 | 243 | ..... | ..... | ..... | ..... | ..... |
| Kansas | 50 | 39 | 1 | 10 | 58,780 | 1,786 | 1,278 | 46 | 82 | 1,828 | 1,391 | 1,583 |
| Kentucky | 10 | 5 | ..... | 5 | 84 | 402 | 579 | ..... | ..... | ..... | ..... | ..... |
| Louisiana | 31 | 18 | 2 | 11 | 3,758 | 1,512 | 1,004 | 29 | 77 | 1,479 | 1,267 | 1,449 |
| Michigan | 39 | 14 | 3 | 22 | 2,313 | 1,093 | 1,336 | ..... | ..... | ..... | ..... | ..... |
| Mississippi | 6 | 5 | ..... | 1 | 2,170 | 167 | 12 | ..... | ..... | ..... | ..... | ..... |
| Missouri | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Montana | 2 | 2 | ..... | ..... | 225 | 173 | 130 | ..... | ..... | ..... | ..... | ..... |
| Nebraska | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 | 7 | 53 | ..... | ..... |
| New Mexico* | 11 | 9 | ..... | 2 | 1,795 | 582 | 586 | 4 | 12 | 507 | 220 | 293 |
| New York† | 17 | 16 | 1 | ..... | 33 | 880 | 557 | ..... | ..... | ..... | ..... | ..... |
| North Dakota | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ohio | 20 | 8 | 7 | 5 | 27 | 946 | 873 | ..... | ..... | ..... | ..... | ..... |
| Oklahoma | 48 | 29 | 7 | 12 | 4,807 | 1,890 | 1,842 | 48 | 96 | 1,651 | 1,846 | 2,059 |
| Pennsylvania† | 24 | 17 | 6 | 1 | 47 | 3,104 | 1,377 | ..... | ..... | ..... | ..... | ..... |
| South Dakota | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Tennessee | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Texas | 168 | 123 | 3 | 42 | 62,194 | 8,834 | 8,527 | 176 | 292 | 9,914 | 9,210 | 10,269 |
| Utah | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| West Virginia | 9 | 1 | 6 | 2 | 25 | 543 | 500 | ..... | ..... | ..... | ..... | ..... |
| Wyoming | 2 | 2 | ..... | ..... | 442 | 138 | 138 | ..... | ..... | ..... | ..... | ..... |
| Total this week | 559 | 381 | 37 | 141 | 161,097 | 27,070 | 23,318 | 454 | 801 | 21,941 | 17,341 | 20,080 |
| Total last week | 609 | 391 | 71 | 147 | 160,959 | 26,497 | 22,832 | 347 | 347 | 21,487 | 16,321 | 20,080 |
| Total this year | 27,244 | 19,592 | 1,687 | 5,965 | 9,443,353 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

* This tabulation includes those states where weekly data are available; figures for Illinois date from October 15, 1939; New Mexico from August 1, 1939.
† Includes water-input wells.

# United States Well Completions—*Continued*

| Company, Well and Location | Init. Prod. Bbls. | Depth |
|---|---|---|
| John Less, Pollard 1, e½ se ne 29-3s-9e | 8 | 3420 |
| Scudamore 1, n½ sw ne 29-3s-9e. | * | 3455 |
| Tide Water, Evans 1, sw sw nw 4-4s-14w | 149 | 2869 |
| Burr Lambert et al, Calvin 5, sw ne sw 9-4s-14w | 135 | 2846 |
| Cherry & Kidd, Gray 3, sw sw se 8-4s-14w | 60 | 2720 |
| Gray 6, se se se 8-4s-14w | * | 2976 |
| Gray 2, nw nw ne 17-4s-14w | 85 | 2710 |
| Magnolia, Cox 2, nw nw se 27-4s-14w | 393 | 2892 |
| Sun, Greathouse 19, ne nw se 33-4s-14w | 147 | 2890 |
| Superior, Stanley 1, sw se nw 27-4s-14w | * | 2586 |
| Givens 4, se ne se 33-4s-14w | 112 | 2895 |
| Penn-Illinois, Pyle 4, c w½ ne ne 12-6s-8e | 40 | 3127 |
| Mercer Bros., Chapman 3, c w½ ne nw 26-6s-8e | 50 | 3159 |
| Olson Drlg. Co., Rosta 1, e½ nw nw 26-6s-8e | 40 | 3184 |
| Carter, Austin 1, ne se nw 22-6s-9e | 24 | 2263 |
| Questell 1, sw nw se 2-7s-9e | 41 | 1700 |

## Indiana

**Daviess County—**

| | | |
|---|---|---|
| Midwest Dev., Dilley 1, nw ne ne 2-2n-5w | * | 2090 |

**Gibson County—**

| | | |
|---|---|---|
| Joe Bander, Cooper 39, ne nw nw nw 19-3s-14w | 105 | 2097 |
| Papoose Oil, Cooper 14, nw ne sw 13-3s-14w | 175 | 2859 |
| Hall Edwards, Rec., Maier 11, sw ne se 14-3s-14w | 300 | 2520 |
| Maier 12, nw ne se 14-3s-14w | 300 | 2523 |
| Continental Oil, Bozeman 15, nw ne ne 23-3s-14w | 210 | 2525 |
| Mumford Realty 2, ne nw ne 25-3s-14w | 102 | 2133 |
| R. L. Bauman, Kleiderer 1, se se se 28-3s-14w | 85 | 2880 |

**Knox County—**

| | | |
|---|---|---|
| Loma Oil, Schaller 1, nw se nw sw 24-2n-11w | * | 1922 |
| Winkler 1 se nw nw nw 25-2n-11w | 75 | 1880 |

**Posey County—**

| | | |
|---|---|---|
| J. E. Crosbie, Keck 4, cw½ sw ne 34-3s-14w | 140 | 2887 |
| W. C. McBride, Swonders 6, sw nw ne ne 4-4s-14w | 286 | 2816 |
| Gulf Ref., Maier 4, se sw ne 7-6s-12w | 42 | 1169 |
| Haynes & Thomas, Seifert 5, ne sw nw se 19-6s-12w | 10 | 385 |
| Paul Rossi, Egli 4, ne se nw 19-6s-12w | * | 2400 |

**Randolph County—**

| | | |
|---|---|---|
| Unionport O. & G. Corp., Johnson 1, c sw ne 9-19n-13e | ¶0.5 | 1043 |
| Haynes 1, c se nw 20-19n-13e | * | 1114 |

**Vanderburg County—**

| | | |
|---|---|---|
| Burr Lambert, Neiderhouse 1, se se nw 22-4s-10w | * | 2215 |
| K. R. Bixby, Tr., Ziss 7, se sw 30-5s-11w | 20 | 1254 |
| Weier & Sparrow, Nurrenburg 1, nw ne sw 5-7s-11w | * | 1170 |

## Kansas

**Barton County—**

| | | |
|---|---|---|
| Johnson, Bitter 10, csl se nw nw 8-16-13w | 378 | 3374 |
| Cities Service, Stoskopf 3, c n½ nw sw 17-16-13w | 3000 | 3392 |
| Kaiser et al, Templing 1, c e½ se se 11-16-14w | 2645 | 3353 |
| Derby, Frees 3, c n½ sw ne 3-17-11w | 3000 | 3331 |
| Texas, Burmeister "B" 1, c w½ nw se 2-17-11w | 1790 | 3382 |
| Petz 5, c e½ sw se 7-20-11w | 1428 | 3337 |
| Bodine et al, Herter 2, csl sw nw se 8-20-11w | 3000 | 3319 |
| Crown et al, Wolf "B" 2, c n½ ne ne 1-20-12w | 2408 | 3367 |

**Butler County—**

| | | |
|---|---|---|
| Bennett et al, Lindley 1, sw se sw 6-27-7e | 50 | 2192 |
| Rex-Morris, Farmer 3, nw sw nw 8-20-7e | 30 | 2658 |

**Cowley County—**

| | | |
|---|---|---|
| Brewer, Starkey "C" 3, ne se se 16-30-4e | 332 | 2786 |
| Wakefield, Hanna 3, c s½ sw 2-31-4e | * | 3041 |

**Ellis County—**

| | | |
|---|---|---|
| Sinclair-Prairie, Cress "A," c e½ sw sw 18-11-16w | * | 3427 |
| Cities Service, Hall "B" 16, ne se nw 26-11-17w | 675 | 3617 |
| Gulf, Alex 1, c n½ se se 30-13-16w | * | 3487 |

**Ellsworth County—**

| | | |
|---|---|---|
| Magnolia, Skalicky 2, c e½ sw nw 9-16-10w | 3000 | 3298 |
| I. T. I. O., Boye 2, c w½ ne nw 16-16-10w | * | 3343 |
| Lario, Mehl 6, c n½ sw se 35-16-10w | 3000 | 3288 |
| Cities Service, Schroeder "A" 8, swc nw 29-17-9w | 3000 | 3225 |

**Grant County—**

| | | |
|---|---|---|
| Columbian Fuel, Hampton 1, sec nw 32-28-36w | ¶11.3 | 2764 |

**Greenwood County—**

| | | |
|---|---|---|
| Dunkin, Fankhauser 2, ne nw sw 20-23-13e | * | 1818 |
| McIntyre et al, Agard 2, se ne ne 23-24-9e | * | 2366 |
| Mendenhall, Souders 2, ne se ne 5-28-11e | 10 | 1272 |
| Lemon et al, Pope 1, se ne se nw 17-28-11e | 25 | 1229 |
| Shell Est. 1, sw ne ne 17-28-11e | 30 | 1230 |

**Marion County—**

| | | |
|---|---|---|
| H.L.M. Oil, Shield 1, c s½ se se 19-17-4e | * | 2493 |
| Hauser et al, Hauser 2, c e½ nw se 28-17-4e | 474 | 2431 |

**McPherson County—**

| | | |
|---|---|---|
| Westgate-Greenland, Eason 2, c e½ se nw 18-17-1w | 1068 | 2669 |
| Cities Service, Myquist 3, c n½ se nw 19-20-5w | 3000 | 3335 |
| Ohio, Lindquist 4, c n½ nw se 19-20-5w | 3000 | 3319 |
| Tulsa Oil, Nelson 3, cwl sw ne ne 19-20-5w | 2351 | 3336 |
| Moulten et al, Bornholdt 4, c s½ nw se 30-20-5w | 1926 | 3354 |

**Phillips County—**

| | | |
|---|---|---|
| Harbar, Ray 1, se sw ne 32-5-20w | 3000 | 3629 |

**Reno County—**

| | | |
|---|---|---|
| Amerada, Wilson 2, ne sw sw 23-23-4w (OTD 3608) | 298 | 3393 |
| Shell et al, Blake 4, sw se sw 23-23-4w (OTD 3608) | 102 | 3414 |
| Duckworth 3, nwc ne 23-23-4w (OTD 3606) | 90 | 3414 |

**Rice County—**

| | | |
|---|---|---|
| Garden et al, Theede 1, csl sw nw sw 14-21-7w | 50 | 3409 |

**Rooks County—**

| | | |
|---|---|---|
| Consumers Co-op, Beardmore 2, c s½ sw ne 10-9-16w | 756 | 3234 |

**Russell County—**

| | | |
|---|---|---|
| Jones & Shelburne, Lewis 1, swc ne 28-14-12w | 1463 | 2325 |
| Coralena, Ehrlich 3, c s½ se se 19-14-13w | 2569 | 2942 |
| Continental, Rein "A" 4, c s½ nw sw 27-14-13w | 891 | 2915 |
| Hayes et al, Fink 1, swc se 16-14-14w | 96 | 3120 |
| Jones & Shelbourne et al, Neidenthal 1, c e½ nw nw 13-14-15w | 1449 | 3052 |
| Phillips, Roesner 2, c n½ nw se 9-15-13w | 3293 | 3063 |
| Shell, Sellens 3, sw nw sw 33-15-13w | 3000 | 3338 |

**Sedgwick County—**

| | | |
|---|---|---|
| Steinbuschel, Vilm 1, nwc ne 18-28-1e | * | 3526 |

**Stafford County—**

| | | |
|---|---|---|
| Alma, Mellies 1, c w½ nw se 36-21-12w | 18 | 3576 |
| Stanolind, McComb 3, c s½ nw sw 12-24-11w (OTD 3757) | 2083 | 3792 |

**Trego County—**

| | | |
|---|---|---|
| York State, Gregler 2, c s½ ne sw 36-12-21w | * | 3892 |

**Woodson County—**

| | | |
|---|---|---|
| Cook et al, Hoffmeyer 1, nec nw 23-23-14e | * | 1643 |

## Kentucky

**Daviess County—**

| | | |
|---|---|---|
| H. C. Farmer, Brown 4 | 3 | 1287 |
| Wheeler 1 | * | 1475 |
| B. Cameron et al, Alkin 5 | * | 1633 |
| W. E. Hupp, Sheriff-Stevens 1 | 27 | 1383 |
| Penn-Ind. Oil, 1st Nat'l Bank 20 | 12 | 915 |

**Hancock County—**

| | | |
|---|---|---|
| Moore & Shields, Roby 8 | * | 463 |
| Fordsville Oil, Ashworth 3 | 30 | 472 |

**Ohio County—**

| | | |
|---|---|---|
| A. W. Tuttle, Berry 11 | * | 190 |
| J. B. Mayer, Brannon 5 | * | 972 |
| Don Rullelim, Downs 9 | 12 | 353 |

## North Louisiana

**Caddo Parish (Pine Island)—**

| | | |
|---|---|---|
| Stanolind, Lane 1-A, 13-21n-15w | 5 | 1652 |

**La Salle Parish (Olla)—**

| | | |
|---|---|---|
| Arkansas Fuel Oil Co., Matthews 1, 26-10n-2e | 230 | 2222 |
| Kees B-2, 7-10n-3e | 70 | 2240 |
| Placid Oil Co., La. Cent. Lbr. Co. 54, 25-10n-2e | 150 | 2394 |
| La. Cent. Lbr. Co. 58, 35-10n-2e | 110 | 2440 |
| La. Cent. Lbr. Co. 59, 35-10n-2e | 125 | 2439 |

**Morehouse Parish (Monroe)—**

| | | |
|---|---|---|
| Southern Carbon Co., Tensas Delta 35, 20-22n-4e | ¶3.25 | 2200 |

**Union Parish (Monroe)—**

| | | |
|---|---|---|
| Nemours Corp., Gardner 1, 14-21n-3e | ¶1.5 | 2200 |

**Webster Parish (Cotton Valley)—**

| | | |
|---|---|---|
| Mid-States Oil Corp., Gaines-Giddens 1, 30-21n-9w | sw | 8680 |

**Catahoula Parish (Wildcat)—**

| | | |
|---|---|---|
| Continental Oil, Tensas Delta et al, 12-9n-7e | * | 9215 |

## South Louisiana

**Anse La Butte—**

| | | |
|---|---|---|
| Glassell, Tortoni 1 | * | 9885 |
| Iberia, Moresi 3 | 135 | 2955 |

**Caillou Island—**

| | | |
|---|---|---|
| Texas, State 69 | * | 8607 |

**Cameron Meadows—**

| | | |
|---|---|---|
| Magnolia, Cameron Meadows 29 | * | 6311 |

**Chacahoula—**

| | | |
|---|---|---|
| Sun, Williams-Cypress 2 | ¶3.6 & 16 | 9569 |

**Chalkley—**

| | | |
|---|---|---|
| Humble, CPSB 5 | * | 9245 |

**Charenton—**

| | | |
|---|---|---|
| Pan-American, Veeder 27 | * | 2784 |

**Darrow—**

| | | |
|---|---|---|
| Humble, Gumbel 18 | 260 | 5779 |

**Hackberry—**

| | | |
|---|---|---|
| Harrison & Abercrombie, Dorion 1 | * | 6225 |

**Neale—**

| | | |
|---|---|---|
| Atlantic, Musser-Davis 3 | 250 | 8430 |

**North Crowley—**

| | | |
|---|---|---|
| Humble, Reiners 3 | 792 | 8810 |

**Roanoke—**

| | | |
|---|---|---|
| Shell, Kratzer 4 (wo) | 320 | 8847 |

**University—**

| | | |
|---|---|---|
| Helis, Duplantier 4-C | 175 | 7199 |
| Nelson 10 | 243 | 7170 |

**Ville Platte—**

| | | |
|---|---|---|
| Continental, Haas 6 | 160 | 10,260 |
| Hughes, Ortego 3 | 432 | 10,254 |

**Welch—**

| | | |
|---|---|---|
| Cheeseman & Cranston, Bourgeouis 1 | ¶0.8 & 50 | 5934 |

**West Lake Verrett—**

| | | |
|---|---|---|
| Shell, St. MPSB 1 | 235 | .... |

**Avoyelles Parish—**

| | | |
|---|---|---|
| Snowden, Fee 1, Lake Latagnier | * | 7210 |

**Calcasieu Parish—**

| | | |
|---|---|---|
| J. C. Chance, Ind. Lbr, Co. 1, Big Woods | * | lcn |

**Evangeline Parish—**

| | | |
|---|---|---|
| W. B. Hamilton, Amy (Lower) 1, Eunice | * | 8025 |

## Michigan

**Allegan County—**

| | | |
|---|---|---|
| Lakeland Oil Corp., Woolf 1, ne se nw 15-1n-14w | * | 1342 |
| W. S. Cook, Clark 1, nw ne ne 22-3n-14w | * | 1571 |
| Voorhees Dr. Co., Bisceglia 1, nw sw nw 27-1n-15w | * | 1497 |
| H. C. Nelson, Koopman 1, nw sw se 9-4n-14w | 225 | 1486 |
| Poelakker 1, se se nw 9-4n-14w | * | 1501 |
| Gordon Oil Co., Koopman 5, ne ne nw 16-4n-14w | 140 | 1493 |
| W. L. McClanahan, Lubbers 2, sw se ne 16-4n-14w | * | 1509 |
| James S. Brailey, Maatman 1, nw nw nw 21-4n-14w | * | 1647 |
| Michigan Dev. Pet. Co., Smith 1, sw se nw 15-4n-13w | 115 | 1603 |
| R. D. Malcolm, Bond 1, ne sw ne 16-4n-13w | * | 1737 |

**Berrien County—**

| | | |
|---|---|---|
| D. A. Matteson, Little 1, sw ne sw 9-6s-17w | * | 747 |

**Clare County—**

| | | |
|---|---|---|
| Taggart Bro. Co., Frackelton 54, c ne 17-18n-5w | ¶10.5 | 1544 |
| Pure, Switzer 5, sw se sw 27-19n-6w | ¶0.5 | 1499 |

**Gratiot County—**

| | | |
|---|---|---|
| Wilson & Twin, Cook 1, c nw 3-10n-2w | * | 896 |

**Huron County—**

| | | |
|---|---|---|
| Basin Oil Co., Woodke 3, se sw se 17-17n-14e | * | 1445 |

**Isabella County—**

| | | |
|---|---|---|
| Richard Leuder, McClintic 1, ne nw sw 3-14n-6w | 160 | 3604 |
| Cities Service, Unit D-1, se nw ne 17-16n-3w | * | 1326 |
| Unit F-1, nw se sw 28-16n-3w | * | 1327 |
| American Dr. Co., Smith 1, se nw sw 21-16n-3w | 45 | 3712 |

**Kent County—**

| | | |
|---|---|---|
| Fisher-McCall, McKay 2, nw sw sw 19-7n-12w | 450 | 1924 |

**Mecosta County—**

| | | |
|---|---|---|
| Richard Erlewine, Tr., Sams 1, sw ne sw 9-13n-9w | * | 3679 |

**Midland County—**

| | | |
|---|---|---|
| Pure, Naramore 35, c n½ nw nw 15-13n-1w | 500 | 3402 |

**Monroe County—**

| | | |
|---|---|---|
| Powell & Gilbreath, Cain 1, nw ne sw 31-6s-6e | * | 2151 |

**Montcalm County—**

| | | |
|---|---|---|
| Smith Pet. Co., Chapin 1, nw nw 14-11n-7w | * | 1386 |

**Muskegon County—**

| | | |
|---|---|---|
| Kent Dr. Co., Sinen 1, sw se se 25-11n-17w | * | 1829 |

**Ogemaw County—**

| | | |
|---|---|---|
| T. F. Caldwell, State 10, nw se nw 6-21n-3e | 30 | 2611 |

**Osceola County—**

| | | |
|---|---|---|
| Weber Oil Co., Gabel 1, ne ne sw 31-18n-10w | 28 | 3635 |
| Taggart Bro. Co., Bank 53, c sw 36-20n-7w | ¶11.5 | 1389 |

# United States Well Completions—*Continued*

| Company, Well and Location | Init. Prod. Bbls. | Depth |
|---|---|---|
| **Ottawa County—** | | |
| Gordon & Bolgers, Daling 3, se sw se 14-7n-13w | * | 1898 |
| Fisher-McCall, Masterson 2, ne ne se 23-7n-13w | 30 | 1887 |
| Smith Pet. Co., Fenske 8, nw ne nw 34-7n-13w | 25 | 1837 |
| E. B. Storm, Zawadski 2, ne sw nw 34-7n-13w | 240 | 1813 |
| West Mich. Consumer, Riemmersma 1, c e½ 18-8n-13w | * | 1370 |
| **Van Buren County—** | | |
| Clapsaddle & Harris, Remington 1, sw se sw 10-1s-14w | 200 | 1256 |
| Peavey 2, se ne ne 15-1s-14w | * | 1299 |
| Peavey 3, nw ne ne 15-1s-14w | * | 1293 |
| Viley 1, se nw ne 15-1s-14w | 125 | 1268 |
| Twin Dr. Co., Blust 1, ne sw ne 15-1s-14w | * | 1299 |
| H. H. Heinig, Miller 1, c s sw nw 21-4s-15w | * | 951 |

## Mississippi

| | | |
|---|---|---|
| **Warren County (Wildcat)—** | | |
| W. O. Allen, Henry 1, 4-7n-4w | * | 7277 |
| **Yazoo County (Tinsley Dome)—** | | |
| Union Prod. Co., Childress 1, 24-10n-3w | 340 | 4950 |
| Perry-Woodruff Unit 1, 13-10n-3w | 370 | 4665 |
| Robinette 4, 19-10n-2w | 480 | 4987 |
| Stevens 7, 13-10n-3w | 500 | 4809 |
| Stevens 17, 13-10n-3w | 480 | 4840 |

## Missouri

| | | |
|---|---|---|
| **Knox County—** | | |
| Wright et al, Schenpp 1, swc se 21-62n-10w | * | 545 |

## Montana

| | | |
|---|---|---|
| **Glacier County (Cut Bank)—** | | |
| Texas Co., Unit 10, c sw se 9-32n-5w | 200 | 3057 |
| **Toole County (Kevin-Sunburst)—** | | |
| C. H. Oien, Engemorn 11, nw ne sw 11-35n-2w | 25 | 1629 |

## Nebraska

| | | |
|---|---|---|
| **Nemaha County—** | | |
| Nemaha Dev. Co., Evans 1, c nw ne 32-5n-15e | * | 3510 |
| **Richardson County—** | | |
| I. T. I. O., Bankers Life 1, c ne se 3-2n-15e | * | 2476 |

## New Mexico

| | | |
|---|---|---|
| **Eddy County—** | | |
| Aston-Fair et al, State 3-B, nwc sw 32-17s-30e | 220 | 2887 |
| Premier Pet. Corp., Beeson 4-B, se ne sw 22-17s-30e | 85 | 3223 |
| Stroup-Yates et al, Travis 2, nw ne se 6-18s-29e | 45 | 3157 |
| **Lea County (Arrowhead)—** | | |
| Gulf, State-Leonard 1-D, ne se ne 3-22s-36e | 83 | 3830 |
| **Lea County (Eunice)—** | | |
| T. P. Coal & O. Co., State 21-A, nec sw 7-22s-36e | 240 | 3845 |
| **Lea County (Halfway)—** | | |
| North Shore Corp., State-Texaco 1-B, sw se ne 16-20s-32e | * | 2728 |
| **Lea County (Maljamar)—** | | |
| Barney Cockburn et al, Baish 24-B, c ne sw 28-17s-32e | 470 | 3861 |
| Baish 26-B, c ne se 28-17s-32e | 432 | 3925 |
| **Lea County (Vacuum)—** | | |
| Magnolia, State 4-P, c ne ne 26-17s-35e | 150 | 4560 |
| **Lea County (Wildcat)—** | | |
| Ted Weiner et al, Saunders 1, c ne ne 20-21s-38e | * | 4710 |
| **McKinley County—** | | |
| Petroleum Prod. Corp., Santa Fe 13, se nw 1-17n-9w | 70 | 1561 |

## New York

| | | |
|---|---|---|
| **Allegany County—** | | |
| Shawnet Oil Co., Merritt farm, Genesee | 4 | 1449 |
| Messer Oil Corp., Koehler farm, Clarksville | 2 | 1420 |
| W. J. Richardson No. 3, Gadsby farm, Bolivar | 6 | 1535 |
| Dick & Dillie, Bardeen farm, Wirt | 4 | 1226 |
| Bradley Prod. Corp., Lewis farm, Alma | 4 | 1457 |
| Dick Oil Co., Cameron farm, Bolivar | 4 | 1420 |
| Cameron farm, Bolivar | 4 | 1432 |
| Scio O. & G. Co., Fuller farm, Scio | 5 | 879 |
| **WATER INTAKE WELLS** | | |
| Trio Oil Co., Durham farm, Bolivar | ... | 1362 |
| Messer Oil Co., Miles farm, Bolivar | ... | 1417 |
| Porge Oil Co., Anderson farm, Alma | ... | 1387 |
| Bradley Prod. Corp., Homestead farm, Bolivar | ... | 1382 |
| Marsh Oil Co., Fay farm, Bolivar | ... | 1433 |
| L. H. Thornton, Agt., Fasset farm, Willing | ... | 1280 |
| H. W. Patterson, Fuller farm, Amity | ... | 906 |
| Sloan & Zook, McDivitt farm, Bolivar | ... | 1380 |
| **Steuben County—** | | |
| Penn-York Nat. Gas Corp., Nixson farm, West Union | ¶8.0 | 5016 |

## Ohio

| | | |
|---|---|---|
| **Athens County—** | | |
| Charles D. Mosher et al, Rean 15 | 3 | 350 |
| **Cuyahoga County—** | | |
| Benedum-Trees, McGurrer 1 | ¶0.4 | 2853 |
| **Gallia County—** | | |
| B. & W. Gas Co., Mink 2 | * | 327 |
| **Licking County—** | | |
| Ross Adams et al, Stevens 21 | 3 | 695 |
| Shrider et al, McKinney 1 | 3 | 523 |
| Allan Willey, Hoover 1 | ¶0.43 | 2640 |
| **Lorain County—** | | |
| Dave Shafer, Getridge 1 | ¶1.26 | 2304 |
| **Medina County—** | | |
| R. C. Holmes et al, Hastetler 7 | 5 | 498 |
| Hastetler 12-W | * | 495 |
| Hastetler 2-W | I | 508 |
| Hastetler 6-W | I | 505 |
| **Meigs County—** | | |
| Roush Bros., Salzer 1 | ¶0.06 | 3200 |
| **Monroe County—** | | |
| Cunningham, Bing Hrs. 1 | * | 1365 |
| **Morgan County—** | | |
| Ross, Almendinger & McDonald, Bankee 1 | 3 | 329 |
| **Muskingum County—** | | |
| Gas Prod. Co. of O., Watson 1 | ¶6.52 | 4203 |
| **Noble County—** | | |
| E. E. Walters et al, Crock 2 | * | 805 |
| **Perry County—** | | |
| Pure, Hull 3 | 10 | 3268 |
| Ohio Fuel, Love 1 | ¶0.25 | 2805 |
| **Washington County—** | | |
| Fairfield G. Co., Mayhugh 1 | ¶0.55 | 1287 |
| McGinnus, McCurdy 1 | * | 1570 |

"I" indicates input well.

## Oklahoma

| | | |
|---|---|---|
| **Carter County—** | | |
| Kyle, Dougherty 9, nw sw se 17-4s-2w | 192 | 2308 |
| Batson, Williams 3, se sw se 20-4s-2w (OTD 2006) | 231 | 2025 |
| Gibson et al, Walker-Voorhees 6, se nw se ne 20-4s-2w | ¶1.5 | 2303 |
| Lamb 2, ne ne 29-4s-2w | 62 | 2230 |
| Turner Stearns 1, sw nw sw sw 21-4s-2w | 342 | 2081 |
| **Comanche County—** | | |
| Smith, Williams 1, se se nw 26-2n-11w | 4 | 245 |
| **Creek County—** | | |
| Viersen, Flannagan 1, sw nw ne 24-14n-10e (TD 3283) | ¶2.0 | 2663 |
| Shell, Linihan 1, ne se ne 31-15n-7e | 177 | 4119 |
| Franchot, Kiefer 36, se se ne sw 17-17n-12e | gas inp | 1501 |
| **Hughes County—** | | |
| Hall-Jordan, Baker 1-A, sec nw 3-8n-9e | * | 2109 |
| **Jackson County—** | | |
| Burnham, Hensley 6-A, ne ne sw nw 10-1n-20w | 172 | 1586 |
| Aloma, Robertson 3, nw ne se 15-1n-20w | 245 | 1377 |
| Minor, Dorman 1, se ne nw 15-1n-20w | 36 | 1486 |
| **Kay County—** | | |
| I. T. I. O., Goodson 1, swc ne 13-28n-3e | * | 3275 |
| **Kiowa County—** | | |
| Dempsey et al, Dempsey 1, sw nw ne 31-4n-18w | * | 290 |
| **Lincoln County—** | | |
| Superior, Wagner 2, sw nw se 10-13n-6e | ¶25.0 | 4167 |
| Sun, Cook 1, swc 1-14n-3e (OTD 5087) | 24 | 4006 |
| Magnolia, Ross 6, sec 2-14n-3e (OTD 4276) | 60 | 4027 |
| **Marshall County—** | | |
| Pure, Little (100) 2, sw nw se 28-5s-7e | 671 | 5097 |
| Little (101) 2, ne sw ne 28-5s-7e | 364 | 5075 |
| Little (201) 1, ne se se 28-5s-7e | 376 | 5063 |
| **Muskogee County—** | | |
| Jordan, Collins 1-A, nw nw se 17-13n-16e | * | 2235 |
| **Noble County—** | | |
| Stanolind, De Vore 1, swc nw 27-22n-2w (OTD 4902) | 97 | 3815 |
| **Okfuskee County—** | | |
| Summit, Steil 7, se se ne sw 18-10n-11e | ¶2.0 | 1251 |
| Mid-Continent, Robinson 1, sec sw 24-10n-11e | * | 2063 |
| Shell, Replogle 4, nec se 35-11-8e | 432 | 3469 |
| Phillips, Johnson 2, sw nw ne 11-11n-10e | 285 | 3212 |
| Dunn et al, Buckley 1, sw sw se ne 12-12n-11e | ¶5.0 | 3495 |
| **Oklahoma County—** | | |
| Phillips, Sawyer 7, nw sw ne ne 22-12n-3w (OTD 6460) | * | 6614 |
| **Okmulgee County—** | | |
| Schock, McKee 2, sw se ne 17-14n-11e (OTD 2404) | 400 | 2410 |
| Eagle, Thompson 1, se se nw se 18-14n-11e | * | 3107 |
| **Osage County—** | | |
| Franchot et al, 21, ne nw ne ne 2-21n-9e | 12 | 1430 |
| Finance, 29, c sw 19-23n-9e | 22 | 2495 |
| Twyman, 1-A, sw ne sw 28-23-11e | * | 1895 |
| Powers et al, 12, se se sw se 26-24n-8e | 40 | 2486 |
| I. T. I. O., 473, c n½ sw ne 28-25-11e | ¶1.3 | 1906 |
| Juby, 7, se nw nw 12-27n-10e | 15 | 1295 |
| **Pittsburgh County—** | | |
| Oklahoma Natural, Bascomb 1, sec 10-7n-18e (OTD 1869) | ¶10.9 | 2094 |
| **Pontotoc County—** | | |
| Senora, Summers 2, nw sw sw 25-5n-4e (OTD 2580) | 40 | 2667 |
| **Pottawatomie County—** | | |
| Dunnett, Rogers 2, sw se sw 31-11n-4e | 300 | 4505 |
| **Seminole County—** | | |
| Hall, Troup et al, White 2, sw nw se 36-6n-8e (OTD 2600) | 112 | 2602 |
| Mid-Continent, Porter 1, nw sw nw 12-7n-7e | * | 4677 |
| **Stephens County—** | | |
| Helmerich & Payne, Wade "B" 2, sw nw se 12-1n-5w | 50 | 6018 |
| C. Carter, Doak 11, se sw nw 6-2s-4w | * | 746 |
| Raizen Bros., Oliver 20, sw ne se 2-2s-5w | 6 | 690 |
| Pace, Fee 21, ne sw nw nw 28-2s-7w | 40 | 1738 |
| **Tillman County—** | | |
| Kadane, Andrews 1, nwc 35-2s-19w | * | 5638 |
| **Wagoner County—** | | |
| Finefield, Kane 1, swc se 33-18n-18e | * | 410 |

## Pennsylvania

**BRADFORD DISTRICT**

| | | |
|---|---|---|
| N. V. V. Franchot, Mgr., Tr, Campbell | 3½ | .... |
| Quinlan Oil Co., Fee | 2 | .... |
| Messer Oil Corp., Loop | 5 | .... |
| J. P. Kervin, Baker | 1 | .... |
| Daly & Healy, Bing 500 | 1 | .... |
| Underwood & Moody, Loop Est. | 1 | .... |
| Forest Oil Corp. | 1 | .... |
| Forest Pet. Corp. | 1 | .... |
| Niagara Oil Corp., 2 wells | 2 | .... |
| Bradford Tr. Co., 26 wells | 26 | .... |
| **WATER INTAKE WELLS** | | |
| Mix Creek Oil Co., Fee | ... | .... |
| Pine Run Oil Co. | ... | .... |
| Forest Pet. Corp., 2 wells | ... | .... |
| Niagara Oil Corp., 3 wells | ... | .... |
| **NEW YORK-PENN GAS FIELD** | | |
| Empire Gas & Fuel Co., Nye | ¶ | .... |
| **MIDDLE DISTRICT** | | |
| Elder & McComb, Buckley | ½ | .... |
| Weaver Trust Est., Harmon | ¶ | .... |
| W. H. Master, Mimm | 1 | .... |
| **BUTLER-ARMSTRONG DISTRICT** | | |
| J. Youngblood, Knox | * | .... |
| Rankin & Jordan, Rankin | ¼ | .... |
| **SOUTHWEST PENNSYLVANIA** | | |
| **Armstrong County—** | | |
| Watson et al, McIntire 2 | ¶0.27 | 3434 |
| Humphrey, Stone & McCall, Bittinger 1 | ¶0.07 | 2598 |
| **Clarion County—** | | |
| Frank Shreffler, Clarion Home 7 | ¶0.06 | 1145 |
| **Indiana County—** | | |
| John Wray et al, Lukehart 2 | ¶0.06 | 3563 |

## East Texas

| | | |
|---|---|---|
| **Joiner Area—** | | |
| Boren Oil Co., Stoddard 8-A (22.4-ac) | 40 | 3546 |
| McMurray Pet. Corp., Turner 31 (195.63-ac) | 1500 | 3796 |
| Sells Pet., Alford 1 (35/100-ac) | 1200 | 3582 |
| **Kilgore Area—** | | |
| M. T. Flanagen et al, Walker-Tidal 13 (91.3-ac) | 1000 | 3640 |
| Potter Bros. Prod. Co., Bagwell-Laird 4 | 750 | 3594 |
| West & Stanford, King 3 (1.86-ac) | 200 | 3646 |
| **Longview Area—** | | |
| Alex McCutchin et al, Jones 4 (4.19-ac) | 7200 | 3599 |
| B. F. Phillips-Philbro Properties, McBride 4 (57.8-ac) | 960 | 3658 |
| McBride 7 (57.8-ac) | 960 | 3646 |
| Shell, Richey 37 (167.38-ac) | 7000 | 3640 |
| John J. Thomas et al, Magrill 2 | 2000 | 3668 |
| **Anderson County (Long Lake)—** | | |
| Alex McCutchin et al, Williams 1 (dual well) | ¶60.0 & 34 | 5293 |
| **Bowie County (Wildcat)—** | | |
| J. G. Strahan & W. E. Neill, Fort 1 | * | 2337 |
| **Ellis County (Wildcat)—** | | |
| W. E. Butler & P. S. Groginski, Sims 1 | * | 4013 |
| **Freestone County (Cayuga)—** | | |
| Tide Water & Seaboard, Moody 2 | 199 | 4024 |
| **Rusk County (Wildcat)—** | | |
| R. T. Myers et al, Buckner 1 | * | 4320 |

# United States Well Completions—*Continued*

| Company, Well and Location | Init. Prod. Bbls. | Depth |
|---|---|---|
| **San Augustine County (Wildcat)—** | | |
| Strum & Womack, O'Keefe 1, Grace sur | † | 6173 |
| **Titus County (Talco)—** | | |
| W. B. Hinton et al, Robertson 2.. | 204 | 4325 |
| Humble, McPeters 7 | 350 | 4320 |

## North Texas

| | | |
|---|---|---|
| **Archer County (Hull-Silk)—** | | |
| Fain-McGaha Oil Corp., Nichols 1 | 1104 | 4445 |
| Magnolia, Parrish 15 | * | 5267 |
| **Archer County—** | | |
| J. L. Alexander et al, White 1.... | * | 457 |
| Bert Ligon et al, White 9-D | * | 1650 |
| **Clay County (Wildcats)—** | | |
| C. A. Beasley et al, Huff 2 | * | 1631 |
| Johnson & Kouri, Taylor 2-40 .... | * | 1350 |
| Norwood-Wood et al, 1st Texas Joint Bank 1 | * | 1366 |
| **Cooke County—** | | |
| Bridwell Oil Co., Flusche 7-B.... | 7 | 1208 |
| **Cottle County (Wildcat)—** | | |
| Ramsey Pet. Corp., Lynch 1..... | * | 5694 |
| **Denton County (Wildcat)—** | | |
| High Point Oil Co., Warfield 1.... | * | 1627 |
| **Jack County—** | | |
| Panhandle Ref. Co., Leffel 3..... | 19 | 3015 |
| **Montague County—** | | |
| Claymont Oil Co., Bouldin-Crow 4.. | 9 | 824 |
| Bouldin-Crow 5 | 24 | 819 |
| **Montague County (Benton-Holmes)—** | | |
| United Producers-Continental, Custers 1-B | 480 | 3718 |
| **Montague County (Bonita)—** | | |
| Sinclair Prairie, North Bonita Unit 1-B | 1504 | 5477 |
| **Montague County (Benton-East Nocona)—** | | |
| Stanolind, Dodson 1 | 916 | 5176 |
| **Wichita County (K-M-A)—** | | |
| Dalport Oil Co., Munger 2-B..... | 488 | 3893 |
| W. H. Hammon et al, Womack 1 (pb to 3750 ft) | 107 | 4410 |
| King Oil Co., Stone 10-A | 328 | 3667 |
| Melat & Graham, Munger 7-A.... | 552 | 3883 |
| Sunray Oil, Denny 3-A | 472 | 3991 |
| Tide Water et al, Mangold 13..... | 552 | 3800 |
| **Wichita County—** | | |
| J. E. Farrell et al, Waggoner Bros. 50-D | 10 | 800 |
| W. H. Hammon et al, Hammon 5-A | 8 | 650 |
| Hanlon & Buchanan, Burnett 1-B.. | * | 1329 |
| Geo. Proctor et al, Foster 2-B..... | * | 1042 |
| Staley Oil Co., Glass 2 | 23 | 1327 |
| C. C. Winfrey et al, Lawrence 1.. | * | 675 |
| Wolfe & Hull, Kempner 2 | * | 703 |
| **Wilbarger County—** | | |
| Davis Oil Corp., Waggoner Est. 10-A | 1120 | 3577 |
| E. M. Stilley et al, Wheeler 1..... | 8 | 1362 |
| **Young County—** | | |
| Bohner & Watson, Prideaux 14.... | 10 | 579 |
| L. T. Burns et al, Bloodworth 1.. | * | 883 |
| Henry Craig et al, Coleman 1.... | * | 1016 |
| S. D. Glover et al, Johnson 28.... | 4 | 587 |
| Johnson 29 | * | 590 |
| J. T. Harrell et al, Rogers 2..... | 72 | 901 |
| Rogers 3 | 168 | 894 |
| E. W. Hunt et al, Gass 9..... | 10 | 1122 |
| Gass 10 | 11 | 1226 |
| Kriss & Hausen, Jeffery 3 | * | 851 |
| Sams & Prideaux, Prideaux 4..... | 10 | 656 |
| A. T. Strong et al, Allen 1..... | 606 | 4303 |
| Eddleman Bros. 1 | 515 | 4305 |
| **Young County (Wildcats)—** | | |
| L. T. Burns et al, Larimore 1 .... | 49 | 876 |
| S. D. Glover et al, Gregg-Pittman 1 | * | 802 |
| Reisch et al, Holbert 1 | * | 805 |

## West Texas

| | | |
|---|---|---|
| **Andrews County (Embar)—** | | |
| Phillips Pet. Co., Cowden-Embar 1-120 | * | 1705 |
| **Ector County (Foster)—** | | |
| Great Western Producers, Johnson 9 | 504 | 4303 |
| Schermerhorn Oil Corp., Johnson 10-B | 397 | 4197 |
| **Ector County (Jordan)—** | | |
| Cities Service, University 4-B..... | 530 | 3610 |
| **Ector County (North Cowden)—** | | |
| M. J. Delaney et al, Smith 9..... | 1305 | 4430 |
| Stanolind, Midland 5-B | 319 | 4621 |
| **Gaines County (Seminole)—** | | |
| Amerada Pet. Corp., Mann 4..... | 672 | 5205 |
| Riley 6-A | 848 | 5350 |
| Osage Dr. Co., Willard-Humble 1-B | † | 5340 |
| **Hockley County (Slaughter)—** | | |
| Sid Richardson et al, Slaughter 6.. | 690 | 4980 |
| Whittington Bros., Alewine 1..... | 585 | 4968 |
| **Pecos County (Wildcat)—** | | |
| Taubert-McKee & Siemoniet, Crockett 1 | 1970 | 5357 |
| **Pecos County (Taylor-Link)—** | | |
| H. G. Eastham et al, University 1-D | 215 | 1810 |
| **Scurry County (Sharon)—** | | |
| F. W. Merrick, Inc., West Texas Nat'l Bank 4 | 51 | 2450 |
| **Upton County (McCamey)—** | | |
| T. P. Coal & Oil Co.-Texas Co., Lane 12-E | 166 | 2347 |
| **Ward County—** | | |
| Gulf, Estes 139 | 309 | 2678 |
| **Yoakum County (Wasson)—** | | |
| Helmerich & Payne, Inc., Dowell 4. | 981 | 5090 |
| Olivia Oil Corp., Stanford-Humble 3-B | 318 | 5250 |
| T. P. Coal & Oil Co., Hearne 4.... | 658 | 5250 |

## West Central Texas

| | | |
|---|---|---|
| **Callahan County—** | | |
| F. J. Borman et al, Harris 2 | * | 419 |
| **Coleman County—** | | |
| Anzac Oil Corp., Overall 20..... | 34 | 2302 |
| North-South Oil Co., Matthews 2.. | 50 | 3847 |
| States Oil Corp., Morris 5..... | 152 | 3602 |
| **Eastland County—** | | |
| Smart & Brooks, Larkin 1 | * | 3165 |
| **Jones County—** | | |
| Bourbon Roy. Co., Young 1..... | * | 1963 |
| T. D. Humphrey et al, Triplett 3 (new pay) | 298 | 2470 |
| King Oil Co., Seth 1 | 250 | 3214 |
| **Shackelford County—** | | |
| C. J. Kleiner et al, Morris 1-C.... | 25 | 1520 |
| Roeser-Pendleton & Conoco, Cook 38-A-85 | * | 1402 |
| **Shackelford County (Wildcat)—** | | |
| R. H. Roak et al, M. Davis 1..... | * | 1165 |
| **Stephens County—** | | |
| Horwitz & Oldham, Maury 3 (pb to 4200 ft) | 180 | 4667 |

## Texas Panhandle

| | | |
|---|---|---|
| **Carson County—** | | |
| Danciger O&R, Moore 8..... | 154 | 3105 |
| Texwell Oil Corp., Byrum 2..... | 100 | 3215 |
| **Gray County—** | | |
| Bert Robinson et al, Byrum 2..... | 170 | 3300 |
| Texas Co., Barrett 10 | 160 | 3304 |
| **Hutchinson County—** | | |
| Continental Oil., Spurlock 1..... | ¶3.7 | 3195 |
| Paloma O&G Co., Lewis 7..... | 123 | 3042 |
| Phillips Pet., Graham 1..... | * | 3364 |
| Texas Co., Pond 32 | 492 | 3050 |
| **Hutchinson County (Wildcat)** | | |
| Ed. Dunigan et al, Mayfield 1..... | * | 3335 |

## South Texas

### CORPUS CHRISTI DISTRICT

| | | |
|---|---|---|
| **Calhoun County—** | | |
| Coronado Oil Corp., Welder 9-A (WC) sec 8, Eusebio Hidalgo gr 500.. | | 6025 |
| **DeWitt County—** | | |
| Atlantic Ref, Conwell 1, (WC) Chas. Lockhart sur | ¶0.43 & 42 | 9952 |
| **Hidalgo County—** | | |
| Phillips Pet, Flores (T. F. Villarreal) 1 (Samfordyce) | 350 | 4181 |
| **Jackson County—** | | |
| Humble, L. Ranch Co., 2-C (Lolita). | 1000 | 5936 |
| Toney 11 (West Ranch)..... | 1000 | 5725 |
| Magnolia, Hinshaw 3 (Lolita)..... | 550 | 6406 |
| West 103-A (West Ranch)..... | 1200 | 5759 |
| West 113-A (West Ranch)..... | 1200 | 5098 |
| Standard Oil of Kans., Willoughby 1 (Lolita) | 500 | 5935 |
| **Jim Wells County—** | | |
| Anderson-Prichard, Mueller et al 7 (Wade City) | 750 | 4934 |
| Charles A. Daubert & W. C. McBride, True 1 (WC) 7 mi ne Alice | * | 5608 |
| T. H. McElvaine, Blashke 3 (Wade City) | 500 | 4920 |
| **Nueces County—** | | |
| Corpus Christi Corp., Wardner, Tr. 11 (Stratton) | ¶10 & 200 | 6538 |
| Lockhart Oil Co. of Tex., Purl 6 (Agua Dulce) | ¶10 & 200 | 6966 |
| Richardson Pet. Co., Guaranty Tit. & Trust Co., 1 (WC) sec 305.... | 450 | 7227 |
| Southern Minerals Corp., King 15-B (Bentonville-King) | 500 | 5655 |
| **San Patricio County—** | | |
| Plymouth Oil Co., Morgan 2 (East White Point) | 500 | 5684 |
| **Victoria County—** | | |
| Barnsdall, Fagan 3 (McFaddin).... | 425 | 5307 |

### LAREDO DISTRICT

| | | |
|---|---|---|
| **Duval County—** | | |
| Magnolia Pet. Co., D.C.R.C. 16 (58) (Lundell) | * | 2277 |
| D.C.R.C. 7 (289) (West Casa Blanca) | 70 | 1024 |
| M. L. Massingill et al, D.C.R.C. 7 (Lundell) | 120 | 1515 |
| W. C. McBride, Worden & Drought 1 (WC) sur 157 | * | 1251 |
| Wellington Oil Co. of Del., Welder Hrs 4-G (Seven Sisters) | ¶20.0 | 3076 |
| **Jim Hogg County—** | | |
| Humble, Bass 21 (Kelsey)..... | 300 | 4748 |
| King Ranch-Colorado 25 (Colorado) | 350 | 3043 |
| V. F. Neuhaus, Martinez (Trevino) 3-E (Colorado) | 500 | 2959 |
| Sun, Thaxton 9 (Colorado)..... | 300 | 2962 |
| **McMullen County—** | | |
| E. E. Sorey, C. T. and O. Kountze 1 (WC) sur 5 | * | 1201 |
| **Starr County—** | | |
| Balridge & King, Garcia Ld & Livestock Co. 1 (WC) por 100..... | * | 4516 |
| **Webb County—** | | |
| Jay Simmons, Moglia 1 (WC) sur 670 | * | 3012 |
| Lee Upton, Garcia 1 (WC) sur 1101 | * | 2510 |
| **Zapata County—** | | |
| Transwestern Oil Co., Yaeger & Strohman 2 (Glen) | 135 | 2179 |

### SAN ANTONIO DISTRICT

| | | |
|---|---|---|
| **Atascosa County—** | | |
| D. L. Higgins et al, Shannon 1 (WC) sur 1098½ | * | 1619 |
| **Bastrop County—** | | |
| Marts & Beaven Inc., Harris 1 (WC) J. Maximilian sur, extends North Dale fld | 115 | 2179 |
| **Caldwell County—** | | |
| Ralph R. Ogden, Miears 1 (Dale).. | 130 | 2168 |
| Miears 3 (Dale) | 150 | 2162 |
| Wiegand Bros. Prod. Co., Briscoe 12-A (Salt Flats) | 150 | 2713 |
| **Frio County—** | | |
| Texas Atlas Oil Co., McWilliams Bros. and Cory 3 (Pearsall).... | 130 | 5642 |
| **Guadalupe County—** | | |
| Pat Armstrong, Neighbors 1 (WC) James Alley sur | * | 2800 |
| Cities Service, Dowdy 8 (Darst Creek) | 42 | 2620 |
| Cities Service, Dowdy 9 (Darst Creek) | 40 | 2629 |
| M. H. Dees and Fred Freeland, Day 2 (Day) | 150 | 2484 |
| Rouse Explor. Co., Lenz 1 (Elm Creek) | * | 1380 |

## Texas Gulf Coast

| | | |
|---|---|---|
| **Alta Loma—** | | |
| Stanolind, Lobit 1 | * | 9342 |
| **Anahuac—** | | |
| Gulf, Willcox 14 | 796 | 7044 |
| Humble, Middleton 50 | 761 | 7227 |
| **Ariola—** | | |
| Houston, Houston & Republic B-4.. | 352 | 4150 |
| **Barbers Hill—** | | |
| Texas Gulf, Wilburn 7 | 37 | 5532 |
| **Clay Creek—** | | |
| Sun, Witt 8 (wo) | 67 | 2073 |
| **Dyersdale—** | | |
| English, Stewart 1 | 300 | 4081 |
| McDannald, Choatas 1 | * | 4094 |
| **Eureka—** | | |
| Houston, Holberg-Lackner 2 (wo) | 277 | 7753 |
| **Hastings—** | | |
| Stanolind, Curkeet 39 | 666 | 6087 |
| **Hockley—** | | |
| Jordon Dr., Warren 1 | 15 | 2230 |
| **Hull—** | | |
| Gulf, Pheonix 1-A | * | 9996 |
| Thomar, Brown 1-A (wo) | 44 | 2075 |
| **Humble—** | | |
| Wilson, Wheeler & Pickens 29 (wo) | 30 | 1972 |
| Holmes 2 (wo) | 79 | 1127 |
| **Ogburn—** | | |
| Richardson-C. C. Dr. Co., Baskins 1 | 420 | 6940 |
| **Old Ocean—** | | |
| Sun, Campbell 6 | 166 | 10,040 |
| **Rowan—** | | |
| Humble, Hubbard 1 | 711 | 8565 |
| Texas Gulf, Moore 1 | * | 8973 |
| **Tomball—** | | |
| Humble, Holderreith 1 (wo) | 21 | 5572 |
| Kobs 6-B | ¶0.04 | 5631 |
| Tallman 1-B (wo) | 17 | 5582 |
| **Withers—** | | |
| Pan American, Halamicek 4 | 35 | 5543 |
| Texas, Pierce B-64 | 73 | 5380 |
| Pierce C-83 | 124 | 5375 |
| Pierce C-84 | 44 | 5380 |
| Thompson A-20 | 69 | 5544 |
| **West Columbia—** | | |
| Hogg, Fee 13 | 205 | 5684 |
| Texas, Hogg 96 | 95 | 3623 |
| Hogg 97 | 100 | 3220 |

## West Virginia

| | | |
|---|---|---|
| **Boone County—** | | |
| Cambridge Gas Co., White & Hill 1 | ¶0.18 | 3615 |
| **Braxton County—** | | |
| Pitt. & W. Va. G. Co., Boggs 7764.. | 25 | 1943 |
| **Gilmer County—** | | |
| McCall Dr. Co., Napier 6 | * | 1900 |
| **Kanawha County—** | | |
| Carbon, Harbert 1 | ¶2.28 | 5319 |
| **Ritchie County—** | | |
| Moon Gas Co., Finley 1 | ¶0.30 | 2107 |
| Earl Goodwin, Davis 1 | ¶0.25 | 2185 |
| **Tyler County—** | | |
| C. B. Smith, Rice 1 | ¶0.37 | 2024 |
| **Wayne County—** | | |
| Owens-Libby-Owens, Baldwin 22.. | ¶0.16 | 1768 |
| **Wood County—** | | |
| M. W. Athey et al, Lauer 10 | * | 883 |

## Wyoming

| | | |
|---|---|---|
| **Niobrara County (Lance Creek)—** | | |
| Continental Oil, Bell 20, nw se se 33-36n-65w | 126 | 5490 |
| Ohio Oil Co., State 9, nw sw nw 36-36n-65w | 316 | 4458 |

# WILDCAT REPORT
## New Starts and Completions

### CALIFORNIA
**FIRST REPORT**

**Los Angeles County**—Bristol Oil Co.'s Spring 1, se corner "R" St and Figueroa, lcn, Torrance-Wilmington area.

**COMPLETIONS**

**Fresno County**—Continental Oil Co.'s Kreyenhagen 1, sec 4-22-16, td 11,020 ft in hard Cretaceous siltstone, Kreyenhagen 8137 ft, abnd, Jacalitos Hills area.

**Ventura County**—E. A. Bender's Farrell 1, sec 5-1-22; td 1010 ft, hole caved, skidding rig for second test, Oxnard area.

### COLORADO
**FIRST REPORT**

**Montezuma County**—Dunning & Love's 1, nec lot 3, sec 4-35n-14w, spd 250 ft, Mancos Divide struct.

### IOWA
**FIRST REPORT**

**Mills County**—J. A. Johnson et al's Lucas 1, sw ne se 28-70n-43w, lcn.

### KANSAS
**FIRST REPORTS**

**Barton County**—Allen et al's Benjamin 1, c w½ sw se 3-19-13w, lcn. Shell's Homolka 1, nec se 24-16-11w, dr.

**Brown County**—Gernon et al's Bruce 1, c e½ se se 15-3s-15e, mach.

**Jefferson County**—Canfield & Sullivan's Ragan 1, swc se 19-10-20e, mach.

**Thomas County**—Billings et al's Ryan 1, c e½ ne se 27-8s-32w, dr.

**Woodson County**—Lewis et al's Keller 1, c e½ ne sw 22-26-13e, testing 1473 ft.

**Rooks County**—Cities Service's Johnston 1, swc ne 5-6-19w, lcn.

**COMPLETIONS**

**Ellis County**—Lario et al's Slimmer 1, c w½ nw nw 12-11-17w, Bemis pool outpost, Topeka 2815 ft, Sooy 3341 ft, Simpson 3468 ft, Arbuckle 3495 ft, abnd 3530 ft.

**McPherson County**—Carey Dr. et al's Coons 1, c w½ sw sw 13-19-1w, 2½ mi e Ritz-Canton pool, Mississippi 2896 ft, td 3425 ft, pb 2917 ft, perf 32 shots 2897-2910 ft, 3,000,000 ft gas.

**Russell County**—Robertson et al's Radke 1, c s½ se sw 18-15-14w, 2 mi sw Gideon pool, Sooy 3415 ft, Arbuckle 3420 ft, abnd 3442 ft.

### NORTH LOUISIANA
**FIRST REPORT**

**Franklin Parish**—H. L. Hunt's Chicago Mill & Lbr. Co. et al 3, c sw se 35-14n-9e, spd.

**COMPLETION**

**Catahoula Parish**—Continental Oil Co.'s Tensas Delta 1, c n½ sw sw 12-9n-7e, elev 61 ft, Wilcox 3101 ft, abnd 9215 ft.

### SOUTH LOUISIANA
**FIRST REPORT**

**East Baton Rouge Parish**—H. C. Cockburn and F. W. D. Oil Co.'s Ganianelli Est. 1, sec 52-8s-1e, 7 mi se University fld, spud on 8500-ft test.

**COMPLETIONS**

**Avoyelles Parish**—Snowden's Fee 1, Lake Latagnier area, sec 22-3n-5e, o/sd 5175-95 ft, Cockfield 3430 ft, Sparta 4048 ft, Wilcox 5176 ft, abnd 7210 ft.

**Calcasieu Parish**—J. C. Chance's Industrial Lbr. Co. 1, Big Woods area, sec 25-8s-12w, abnd lcn.

**Evangeline Parish**—W. B. Hamilton's Amy (Lower 1), Eunice area, sec 39-6s-1e, o/sd 2150 ft, abnd 8025 ft.

### MICHIGAN
**FIRST REPORTS**

**Berrien County**—K. G. Nilsen's Milham 1, se se sw 31-6s-19w, lcn.

**Oceana County**—Welsh Oil Co.'s Branstrom 1, sw sw sw 12-13n-15w, rig.

**Ogemaw County**—Weber Oil Co.'s Krug 1, sw nw se 11-23n-2e, dr.

**Ottawa County**—Turner Pet. Co.'s Nibbelink 1, sw se sw 24-7n-15w, rig.

**COMPLETIONS**

**Allegan County**—Lakeland Oil Corp.'s Woolf 1, ne se nw 15-1n-14w, Traverse 1295 ft, abnd 1342 ft. W. S. Cook's Clark 1, nw ne ne 22-3n-14w, Traverse 1566 ft, abnd 1571 ft. Voorhees Dr. Co.'s Bisceglia 1, nw sw nw 27-1n-15w, Traverse 1175 ft, abnd 1397 ft.

**Berrien County**—D. A. Matteson's Little 1, sw ne sw 9-6s-17w, Traverse 732 ft, abnd 747 ft.

**Mecosta County**—Richard Erlewine, Tr.'s Sams 1, sw ne sw 9-13n-9w, Dundee 3444 ft, sg 3626 ft, abnd 3679 ft.

**Montcalm County**—Smith Pet. Co.'s Chapin 1, nw nw 14-11n-7w, abnd 1386 ft.

**Muskegon County**—R. C. Lentz, Tr's Sinen 1, sw se se 25-11n-17w, Traverse 1792 ft, abnd 1829 ft.

**Osceola County**—Weber Oil Co.'s Gabel 1, ne ne sw 31-18n-10w, Dundee 3521 ft, Monroe 3625 ft, pay 3628 ft, td 3635 ft, 28 bbls pump after acid, new fld.

**Ottawa County**—West Michigan Consumers Co.'s Riemmersma 1, c e½ 18-8n-13w, Berea 1272 ft, abnd 1370 ft.

**Van Buren County**—H. H. Geinig's Miller 1, c s½ sw nw 21-4s-15w, Traverse 938 ft, abnd 951 ft.

### MISSISSIPPI
**FIRST REPORT**

**Forrest County**—Fohs Oil Co.'s Batson-Hatten 1, sec 10-1s-12w, rig for 8000-ft test.

**COMPLETIONS**

**Warren County**—W. O. Allen's Henry 1, c w½ sw 4-7n-4w, elev 281 ft, Cockfield 870 ft, Minden 1350 ft, Sparta 1519 ft, Cane River 2431 ft, Talahatta 2659 ft, Wilcox 3010 ft, Midway 5762 ft, Eutaw 6840 ft, Eutaw sand (slightly salty) 7250 ft, abnd 7277 ft, 7000-ft contract.

### MISSOURI
**FIRST REPORT**

**Randolph County**—Randolph Dr. & Leasing Co.'s Tregnargo 1, c se ne 33-53n-14w, mach.

**COMPLETION**

**Knox County**—Wright et al's Schenpp 1, swc se 21-62n-10w, Mississippi 175-495 ft, Kinderhook 500-540 ft, Devonian 540 ft, abnd 545 ft.

### NEBRASKA
**FIRST REPORTS**

**Nemaha County**—Francis Krone et al's Morehead 1, c ne sw 35-4n-16e, lcn. Pulliam


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et al's Lawrence 1, c w½ sw nw 35-5n-15e, dr.

**Pawnee County**—Black Gold Oil Co.'s Hauner 1, c nw ne 31-3n-11e, rur.

**COMPLETIONS**

**Nemaha County**—Nemaha Dev. Co.'s Evans 1, c nw ne 32-5n-15e, 5 mi se Auburn, Mississippi 1782 ft, base Mississippi 1960 ft, Hunton 2218 ft, Maquoketa 2906 ft, Viola 2994 ft, St. Peter (Wilcox) 3387 ft, Arbuckle 3427 ft, abnd 3510 ft.

**Richardson County**—I. T. I. O. Co.'s Bankers Life Ins. 1, c ne se 3-2n-15e, 5 mi sw Shubert pool, Hunton 2418 ft, td 2476 ft, pb 2444 ft, shot 10 qts 2433-40 ft, co 2431 ft, 500 gals acid, hfw, abnd 2444 ft.


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## NEW MEXICO

**COMPLETIONS**

**Lea County**—Ted Weiner et al's Saunders-Humble 1, c ne ne 20-21s-38e, elev 3534 ft, anhydrite 1610 ft, salt series 1690-2756 ft, abnd in sul w 4705-10 ft.

## EAST TEXAS

**FIRST REPORTS**

**Angelina County**—K. L. McHenry et al's Cameron Lumber Co. 1, 2793-ac tr, W. B. Anderson sur, 7 mi se Zavalla, dr 1860 ft.

**Panola County**—Turner & Smith's Panola Dev. Co. 2, Gillespie sur, mat.

**COMPLETIONS**

**Bowie County**—J. G. Strahan-W. E. Neill's Fort 1, nec 103-ac tr, Lem Peters sur, elev 371 ft, abnd 2337 ft.

**Ellis County**—W. E. Butler & P. S. Groginski's Sims 1, NWc 58.21-ac tr, R. de la Pena sur, elev 485 ft, Austin chalk 550-1055 ft, Woodbine 1505 ft, Georgetown lime 1988-2403 ft, Anhydrite 3331-83 ft, Travis Peak 3770 ft, abnd 4013 ft.

**Rusk County**—R. T. Myers et al's Buckner 1, se part 158-ac tr, D. Warren sur, elev 278 ft, Pecan chalk 3180-3565 ft, Austin chalk 3966-4168 ft, abnd in Georgetown lime 4310-20 ft.

**San Augustine County**—Strum & Womack's O'Keene 1, Grace sur, jnk 6173 ft.

## NORTH TEXAS

**FIRST REPORTS**

**Archer County**—Home Oil Co.'s Meade 2, ne¼ blk 2, W. S. Blount sur A-13, sp.

**Cooke County**—Dick Eubanks et al's Seagraves 1, SEc of O. M. Gray sur A-415, rig for 2150-ft test.

**Montague County**—Tom F. Hunter et al's Fatheree-Conoco 1, se part S. L. Gilliland sur A-1225, Illinois Bend prospect, sp.

**Wichita County**—G. C. Winfrey et al's Davis 1, sw¼ blk 28, Tarrant CSL sur, mim for 800-ft test.

**Young County**—Kerlyn Oil Co.-Phillips Pet. Co.'s Griffin 1, se se TE&L Co. sec 1951, sp and 4400-ft test.

**COMPLETIONS**

**Clay County**—C. A. Beasley et al's Huff 2, J. Bradshaw sur A-17, abnd 1631 ft. Johnson & Kouri's Taylor 2-40, north cor blk 40, Bacon subd, abnd 1350 ft. Norwood-Wood et al's First Texas Joint Stock Bk 1, blk 13, Thornberry subd, abnd 1366 ft.

**Cottle County**—Ramsey Pet. Corp.'s Lynch 1, sw sw sec 66, J. Poitevent sur, Canyon 4380 ft, Mississippian 5405 ft, Cambrian 5503 ft, abnd in granite 5689-94 ft.

**Denton County**—High Point Oil Co.'s Warfield 1, nwc 252½-ac tr, C. Manchaca sur, abnd 1626 ft.

**Young County**—L. T. Burns et al's Larimore 1, sw TE&L sec 210, Gunsight lime 830-33 ft, sand 866-76 ft, pumped 49 bbls. S. D. Glover et al's Gregg-Pittman 1, J. H. Kimble sur A-1472, abnd 802 ft. Reischman et al's N. G. Holbert 1, ne TE&L sec 726, abnd 805 ft.

## WEST CENTRAL TEXAS

**FIRST REPORTS**

**Eastland County**—W. M. Morris et al's Bryant 1, sw se H&TC sec 20, blk 1, lcn.

**Jones County**—G. M. Gillespie et al's King 1, nec nw sec 53, Orphan Asylum Lands, lcn.

**Shackleford County**—R. H. Roark et al's 1-31, n½ se T&P sec 31, blk 12, lcn.

**COMPLETIONS**

**Jones County**—Thos. D. Humphrey et al's Triplett 3, J. J. Hughes sur No. 201, new deep pay, 500 gals acid 2465-70 ft, flowed 298 bbls initial via choke.

**Shackelford County**—R. H. Roark et al's Davis 1, sw se sw T&P sec 36, blk 12, abnd 1165 ft.

## WEST TEXAS

**FIRST REPORT**

**Pecos County**—L. C. McKean et al's Breen (Anderson-Prichard) 1, west cor n¼ H&GN sec 52, blk 10 lcn.

**COMPLETIONS**

**Pecos County**—Taubert - McKee & Siemonelt's Crockett 1, lot 4, sec 4½, blk 3, H&TC sur elev 2392 ft, brown lime 1170 ft, Yates sand 1240 ft, Simpson 4755 ft, Simpson pay 5283-92 ft and 5320-40 ft, td 5357 ft, flowed 929 bbls oil 11-1/3 hrs natural via ½-inch choke.

**Val Verde County**—Joiner Oil Corp.'s Sellers 1, sec nw I&GN sec 59, blk A, abnd 2250 ft.

## SOUTH TEXAS

**FIRST REPORTS**

**Atascosa County**—Bennett & Lipton's Franklin Ranch 1, A. Williams sur 950, abnd 1617 ft.

**Bee County**—Magnolia's Page Bros. 1, 123.86-ac tr, W. T. Evans sur, 4 mi sw Pettus townsite, lcn for 4000-ft test.

**Fayette County**—O. C. Garvey's Meyer et al 1, 87.17-ac tr, James Murphy sur, ab 242, 2000-ac farmout fr Texas Co, 3 mi ne Fayetteville, wor, contract to Houston Dr Co. for 6500-ft test.

**Jackson County**—W. Stewart Boyle, John Mayo and C. A. Wright's Terrell 1, 366-ac tr, William Murphy sur, 1 mi e Navidad River, contract to Wright Dr. Co. for 6000-ft test.

**Live Oak County**—Danciger Oil & Refineries' San Antonio Joint Stock Land Bank 1, blk 13, Thomas Henry sur, 2¾ mi w Three Rivers, contracted by Humphries & Hotchkin, abnd, 1020 ft.

**Nueces County**—S. E. W. Oil Corp. et al's Pfluger 2, 600-ac tr, sec 186, F. Z. Bishop Palo Alto subd, ½-mi w Pfluger 1, 6 mi w Bishop, 1 m s oil prod on se flank Agua Dulce fld, ru for 7200-ft test.

**San Patricio County**—Henderson Coquat and Wilcox O. & G. Co.'s Mercer 1, nw 40 ac of sw 160 ac, sec 11, George H. Paul's subd Welder Ranch, 4 mi n Mathis, ru, Coquat's rig.

**Victoria County**—Humble's Ragsdale 1, 3154.6-ac lse, V. Garcia gr, 5 mi s Inez, East Telferner area, lcn for 6500-ft test.

**Willacy County**—Pan American's Willamar Community 1-B, 39.92-ac tr, (T. G. Garcia tr), sh 13, San Juan de Caricitos gr, 1015 ft s and little e Garcia 1, lcn for 9000-ft test.

**COMPLETIONS**

**Calhoun County**—Coronado Oil Corp.'s Welder 9-A, sec 8, blk 3, Eusebio Hidalgo gr, 17,978-ac blk, 1426 ft s, 10 deg. 45 min e Welder 1, Duck Bay area, td 6025 ft, comp, est 70 bbls, 3/32-in ch, 1030 lbs tp, 1370 lbs cp, perf 5660-61 ft, extends Duck Bay fld s, contracted by Allen & Morris.

**DeWitt County**—Atlantic Ref's Conwell 1, 137.01-ac tr, Charles Lockhart sur, Thomaston area, Wilcox 7735 ft, td 9952 ft, comp 41.4 bbls, ¼-in and ⅜-in chs, 240 lbs tp 380 lbs cp, perf 7918-22 ft, 31.2-gr, wtr 88 percent, gas/oil ratio 10,024/1, extends Thomaston fld 1 mi ne, contracted by Otis Dyer.

**Duval County**—W. C. McBride's Worden & Drought 1, nw ¼, sur 157, 24 mi nw Freer, 3 mi e Adami fld, abnd 1251 ft, contracted by Gordon Johnson.

**Guadalupe County**—Pat Armstrong's Neighbors 1, 24-ac tr, James Alley sur, 8 mi s Seguin, Austin Chalk 2750 ft, abnd 2800 ft in ch, Armstrong's rig.

**Jim Wells County**—Charles A. Daubert and W. C. McBride's True 1, 200-ac tr, Los Presenos de Abajo gr, ab 171, 7 mi ne Alice, abnd 5608 ft, contracted by Bob Lipscomb.

**McMullen County**—E. E. Sorey's Klountz 1, 400-ac tr, E. T. R. R. Co. sur 5, 25 mi s Tilden, abnd 1201 ft, Sorey's rig.

**Nueces County**—Richardson Pet. Co.'s Guaranty Title & Trust Co. 1, 509.53-ac tr, sec 305, F. Z. Bishop Sudb Brayton gr, ½-mi e McCoy 2, 3000 ft se outpost to Agua Dulce, td 7227 ft, comp 165 bbls, ⅛-in ch, 1750 lbs tp, 2400 lbs cp, perf 6889-95 ft, Extends Agua Dulce.

**Webb County**—Jay Simmons' Moglia 1, 547.3-ac lse, sur 670, 9½ mi n Bruni, abnd 3012 ft, Lee Upton's Garcia 1, sur 1101, 320-ac tr, 1½ mi ne Oilton, abnd 2510 ft.

**Starr County**—Baldridge & King's Garcia Ld and Livestock Co 1, w½ por 100, Camargo Juris, Sun farmout, nw Samfordyce fld, abnd 4516 ft, contracted by M. B. Walker.

## TEXAS GULF COAST

**FIRST REPORTS**

**Brazoria County**—Coastal Dr. Co.'s Ransome 1, C. S. Gorbett sur, 1½ mi sw Sandy Point field, lcn.

**Wharton County**—Texas' Wyer 1, W. F. Dobbins sur, Abs 88, ne Louise, lcn.

**COMPLETION**

**Chambers County**—Humble's State 6-B-300, Galveston Bay, 2 mi sw Red Fish Reef fld, 5588 ft sw State 1-B, abnd 9500 ft.

## WYOMING

**FIRST REPORTS**

**Crook County**—M. D. Miller's Commercial 1, sw se 19-49n-66w, mist, 1½ mi east of shallow prod in Wakeman Hills area.

**Washakie County**—W. E. Sykes' Government 1, se se ne 23-43n-89w, lcn, Mahogany Butte struct.


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# MEN IN THE INDUSTRY'S NEWS

**J. FRENCH ROBINSON,** president of The Peoples Natural Gas Company, Pittsburgh, last week was named president and a director of East Ohio Gas Company, Cleveland. He succeeds Charles E. Gallagher, Cleveland, who was elected board chairman.

Robinson, who will resign his post with The Peoples Natural Gas Company, graduated from West Virginia University in 1915 with a B. S. degree in civil engineering. While in the university and after graduation he worked as assistant geologist for Baltimore & Ohio Railroad Company until 1918, when he went with the Ford Run Franklin Coal & Coke Company in West Virginia as engineer and superintendent. That year he received a master of science degree at West Virginia University. He left in 1919 to become geologist and engineer for Seneca Hill Oil Company in the southwest.

Appointed assistant state geologist for Pennsylvania in 1920, he left a year later to join The Peoples Natural Gas Company as geologist and engineer. He also was associated with affiliates of the company in Ohio, West Virginia, Kentucky, Tennessee and Pennsylvania. During this period, Robinson made a two-year study of the various sand horizons in the Appalachian district which required the study of 15,000 wells in Pennsylvania, Ohio, West Virginia and Kentucky. For this work the University of Pittsburgh gave him the honorary degree of Doctor of Science in 1929.

**DR. WILLIAM A. MUDGE,** metallurgist for The International Nickel Company, New York, last week discussed "Nickel and High-Nickel Non-Ferrous Alloys, Their Manufacture, Fabrication, Properties and Uses in Welded Structures," before the Pittsburgh Section of the American Welding Society. F. G. Flocke, with the company's development and research division, discussed "Practical Aspects of Welding Monel, Nickel and Inconel."

**FLOYD E. MELOTT,** North Texas geologist for Continental Oil Company and employed by the company since 1926, resigned November 15 to become district geologist for Deep Rock Oil Corporation. He will continue to reside at Wichita Falls.

**CHARLES McKEEN,** 51, West Texas-New Mexico district superintendent for Barnsdall Oil Company, died November 7 of a heart attack at Odessa, where he had resided a number of years. He entered the services of the company in 1911.

**R. G. DAILY,** 70, president of Daily Crude Oil Company, was found dead in his hotel room at Alma, Michigan, October 10, apparently the victim of a heart attack. Althought ailing for several years, Daily had continued active and had planned to drive to Newark, Ohio, the day after his death, having delayed the trip to personally supervise completion of two of his company's wells, one a wildcat in western Michigan.

Born in New Lexington, Ohio, Daily entered oil business when in his 'teens and devoted his life to it. He had operated in Kentucky, Pennsylvania, Illinois and Ohio before coming to Michigan in 1933. He discovered the Home pool, Montcalm County, in 1933.

**GEORGE H. BUCHER,** president of Westinghouse Electric & Manufacturing Company, Pittsburgh, and 15 other employes at the company's Pittsburgh offices received gold emblems in recognition of 30 or more years' service. A. W. Robertson, chairman, presented the awards.

Ralph Kelly, vice president in charge of sales; Roscoe Seybold, vice president and comptroller; and H. F. MacLane, director of financial accounts, were others among those who received 30-year gold service buttons. L. W. Lyons, treasurer, received a 35-year button, and H. N. Mathias, general cost accountant, a 40-year ruby and gold emblem. Roland R. Davis, Thomas R. Langan, F. C. Gheen, F. L. Lee, J. W. John and J. A. Dickey were given 35-year emblems, and 30-year buttons were presented to W. D. O'Connell, W. J. Otterson, H. E. Brunk and Miss Ella G. Richardson.

Bucher has been with the company since 1909, when he enrolled as a member of the graduate students' training course at the company's East Pittsburgh works. He began at a wage of 18 cents an hour, winding coils in the shop. He was elected president in 1938. Kelly also joined the company in 1909, following his graduation from Harvard University.

**J. O. HARPER,** North Texas scout of The Pure Oil Company, has been transferred from Wichita Falls to Jackson, Mississippi, to report on activity in the upper portions of Mississippi, Alabama and Georgia. He will be succeeded by Jas. F. Brannan, who has been stationed in West Texas.

**ROBERT B. CAMPBELL,** geologist of Tampa, Florida, has been awarded the achievement medal of the Florida Academy of Sciences for his paper presented to the last annual meeting of the academy on, "Outline of the Geological History of Peninsular Florida."

**M. F. HAMPTON** has been named as sales manager for Twentieth Century Manufacturing & Supply Company, Tulsa.

**WILBUR JOHNSON,** land department of The Carter Oil Company, has been transferred from Jackson, Mississippi, to Bismarck, North Dakota.

**W. H. CORREA** has been chosen president of the recently formed Socony-Vacuum Oil Company of Canada. J. R. N. Briggs is vice president.

**LUKE MOORE,** 52, oil operator of Waco, Texas, died November 7 at a hospital in Carlsbad, Texas, where he had been confined four months.

**WILLIAM J. CUSHMAN,** with Colombian Petroleum Company at Cucuta, Colombia, won the pig-skin bag offered as the prize at the Houston Nomad's barbecue last week. The club entertained a number of oil men who had served abroad, and following a dinner of barbecue and the trimmings, each guest was presented with ten thousand counterfeit "bucks." The bag was offered as the prize to the person who could run his "ten thousand" into the greatest sum by means of sundry games of chance. Cushman concluded his efforts with about 600,000 "bucks." The affair was held at the Braeburn Country Club. Cushman, who is in the United States on vacation, will return to Colombia around January 1.

**WALTER WARD CLOPTON,** Wichita Falls district pipe line superintendent for United Gas Pipe Line Company, has been appointed district manager. He has been employed in the Wichita Falls district since 1936, starting as section foreman after transfer from Latex, Texas, where he held the same position. He was first employed by the company June 1, 1924. Born in Corsicana, Texas, and a graduate of the public schools of that city, he also attended Draughon's Business School in Dallas. He has been connected with the oil and gas industry since 1921.

**DR. EDWARD BARTOW** has been granted a year's leave of absence as emeritus professor of the University of Iowa department of chemistry and chemical engineering to join the research laboratories of Johns-Manville Corporation at Manville, New Jersey, as chemical consultant.

**H. D. EASTON, JR.,** geologist and petroleum engineer of Amory, Mississippi, has been ordered to active duty with the United States Army for a year's training and has been assigned to a three-month battery officers' course at Fort Sill, Oklahoma. His work will be handled by his father, H. D. Easton, from the latter's Shreveport office.

**C. P. CHISHOLM,** Gulf Coast chief scout for The Pure Oil Company, Houston, was a visitor in Fort Worth late last week.

**DON R. JOHNSON,** now assistant to Dr. R. S. Knappan in the Tulsa office of the Gulf Oil Corporation, was formerly with Kingwood Oil Company at Effingham, Illinois.

**H. W. HAIGHT,** following a visit to the United States, returned to his post at Cairo, Egypt, as manager of operations for Standard Oil Company of Egypt.

**V. C. SCOTT,** formerly in the Tulsa office of The Texas Company, has been transferred to the company's geological de-

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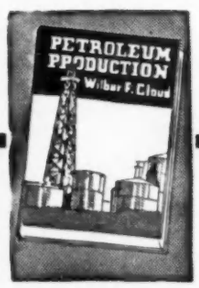


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# MEN IN THE INDUSTRY'S NEWS

partment at Mattoon, Illinois. B. M. Miller, formerly in Mattoon, fills the position vacated in the Tulsa office by the transfer.

**L. McKILLOP** is now field manager for the Papuan Apinaipi Petroleum Company, of Sydney, Australia. He has been in charge of drilling operations in Australia for Oil Search, Limited, for the past ten years.

**ISAAC J. WEST** is now superintendent of the Illinois-Indiana division of Lewis Production Company, Tulsa, with headquartesr at Mount Carmel, Illinois. He was formerly located in the Abilene, Texas, office of the company.

**L. G. ATKINSON,** who joined Westinghouse Electric & Manufacturing Company, following graduation from North Carolina State College in 1933, has been named manager of sales for the company's De-ion circuit breakers.

**WILLIAM D. ROBERTSON,** 57, Shreveport rig builder, succumbed to a sudden heart attack last week while erecting a rig for a wildcat test in Forrest County, Mississippi.

**JACK C. JONES,** of Pampa, Texas, has been named West Texas-New Mexico district foreman for the Humble Pipe Line Company, with headquarters at Odessa. He succeeds the late Jim Griffin.

**J. A. TONG,** Socony-Vacuum Oil Company, formerly at Caracas, Venezuela, last week was in Houston, visiting at the offices of Magnolia Petroleum Company.

**R. S. WARNOCK, JR.,** of Magnolia, Arkansas, has been appointed by Governor Carl Bailey, as a member of the Arkansas Oil & Gas Commission, succeeding L. A. Longino, who resigned because of ill health. Warnock's term will expire in 1943.

**E. W. GILDART,** of Norvell-Wilder Supply Company, Beaumont, was named president of the Petroleum Equipment Suppliers Association when the group held its annual meeting in Chicago last week coincident with the American Petroleum Institute. Earl W. Miller, American Iron Machine Works Company was named vice president, and Wharton Weems, Houston, was reelected executive secretary and counsel.

Directors named are:

Eastern District—George H. Alten, Fred Miner, Casper A. Ruf, Fred J. Spang, Jene Harper, and A. W. McKinney.

Mid-Continent District—W. M. Bovaird, J. R. Brooks, R. D. Brown, Frank J. Hinderliter, John J. Larkin, Earl W. Miller, A. A. Moody, J. L. Shakley, Guy A. Thompson and Walter O'Bannon.

Southwestern District—W. L. Childs, John T. Crotty, E. W. Gildart, Allen Guiverson, J. W. Kinabrew, W. J. Morris, H. W. Fletcher, W. B. Sharp, J. H. Percy C. Jones, Sam Gregg, Donald W. Mackie, Jerry McJunkin, F. F. Murray, John Teer, E. M. Smith and Wallace D. Wilson.

Pacific District—J. C. Axelson, Markley C. Brown, J. A. Crawford, E. S. Dulin, D. S. Faulkner, H. H. Glen, H. E. Howard, L. H. Keim, M. E. Montrose, L. N. Slater, Roy Somers and Ted Sutter.

**Earl W. Miller (left) of American Iron and Machine Works Company, Oklahoma City, and E. W. Gildart, of Norvell-Wilder Supply Company, Beaumont, conversing in a corridor of the Stevens Hotel following their election as vice-president and president respectively of the American Petroleum Equipment Suppliers Association.**

# NOTES FOR THE Equipment Buyer and User

## Valve

**READING-PRATT & CADY DIVISION**

A new bronze glove valve with a full plug-type seat and disc and designed for throttling services on high-temperature and high-pressure steam lines, has been announced by Reading-Pratt & Cady Division of American Chain & Cable Company, Reading, Pennsylvania.

The valve is also intended for use on high-pressure lines carrying boiler scales and other gritty substances which act on seating materials. The body is of a hard bronze, disc and seat is of heat-treated stainless steel of 500-Brinell hardness, and stem is high strength wear-resisting bronze.

## DC Motors

**GENERAL ELECTRIC COMPANY**

A new line of DC motors featuring rolled-steel frame and improvements in end-shield and bearing-bracket designed to give protection from external damage, have been announced by General Electric Company, Schenectady, New York. They employ Formex wire coils and the Glyptal insulating varnish to provide resistance to impact, abrasion and the action of foreign materials.

Furnished with sleeve or ball bearings, the motors are available in constant-speed ratings from ½-horsepower at 850 revolutions per minute up to and including 60-horsepower at 1750 revolutions per minute, and in adjustable-speed ratings from ½-horsepower at 850/3400 revolutions up to and including 15-horsepower at 500/1800 revolutions.

Motors in larger ratings, beginning at 50-horsepower, 850 revolutions per minute, employ a new system of self-ventilation, extra protection of all current-carrying and rotating parts, and large conduit boxes. New V-type double brush-holders are designed to give better commutation and to permit rotation in either direction. A new lifting lug is provided to facilitate handling.

## Nickel Use

"Nickel Cast Iron News," published by The International Nickel Company, New York, contains in its November issue an article on "Class 40 Alloyed Iron Cranks Oil Well Pumps."

## Rotary

**OIL WELL SUPPLY COMPANY**

A new 21-inch rotary, designed for a maximum drilling depth of 17,000 feet and with rated supportable dead-load capacity of 300 tons, has been announced by Oil Well Supply Company, Dallas. Designated Super-Speed, it has been tested at speeds as high as 1000 revolutions per minute. Gear ratio is 2.61/1.

The gear train is of the spiral-bevel type. Both gear and pinion are heat-treated, forged, alloy steel, and the pinion is surface-hardened. The main bearing, developed for high-speed applications, is of self-centering angle-contact ball type with surface-hardened, heat-treated and ground, alloy-steel races and precision-ground steel balls of large diameter.

With forced-feed lubrication, a pump circulates a flow of oil through each of the pinion-shaft roller bearing assemblies and through the hold-down ring, designed to keep the latter under positive pressure. It also sprays oil onto the spiral-bevel pinion, and the meshing of the gear teeth forces a stream of oil into the main table bearing. In addition to the forced-feed lubrication, the pinion picks up oil from the oilbath and the resulting splash causes it to flow through separate troughs to the pinion-shaft roller bearings. A pressure-relief valve and a pressure gauge are included in


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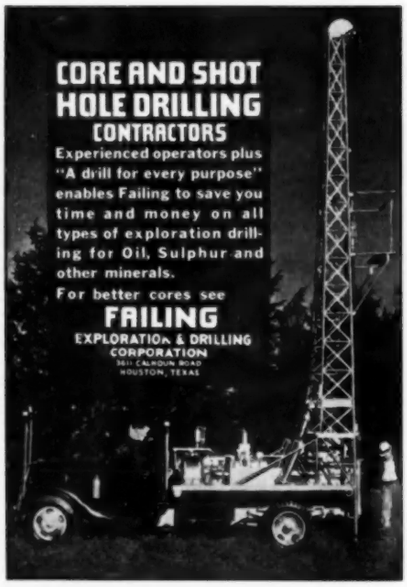
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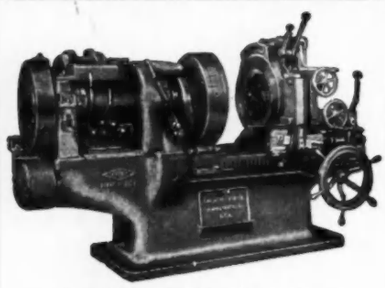

New Landis 4¾ Receding Chaser Pipe Threading Machine

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4000 Clay, Houston, Texas
Fairfax 1466


# NOTES FOR THE Equipment Buyer and User

Oil Well Supply Company's 21-Inch Super-Speed Rotary

the forced-feed system. The gauge is inset in the side of the base and is protected against damage by an open-mesh screen. Oil for both lubrication systems is picked up from a reservoir in the base after it passes over an overflow wall from a settling basin where foreign matter settles into pockets at the cleanout drains to assure clean oil for all parts subject to wear. The table hold-down ring overlaps the oil-retainer ring to provide return of the lubricant at all times.

A labyrinth seal at the circumference of the table is designed to prevent loss of oil at the top of the base and to keep mud and water from entering the oilbath. The seal is covered by a cast-steel table guard, bolted to the base and is completely surfaced with a diamond-pattern safety tread. In addition to providing for the protection of the crew, the guard is intended to prevent mud from being slung over the derrick floor. It is flared outward to dispose of mud without allowing it to cake around the labyrinth seal.

The heat-treated pinion shaft, pinion locking wheel, lubricator drive pinion, shaft roller bearings and their housings comprise a compact and sturdy unit-assembly which fits into a cylindrical opening cast integral with the base, and designed to provide a very rigid construction.

## Thermometers and Gauges

The Brown Instrument Company, Wayne & Roberts Avenues, Philadelphia, has issued Catalog 6706 describing its complete line of vapor-actuated, gas-actuated, mercury-actuated and portable thermometers for indicating, recording and controlling processing operations. Design features described include rectangular case, flat spiral actuating elements and overload safeguard.

## Welding

The Lincoln Electric Company, Cleveland, has issued "The Lincoln Weldirectory," giving 58 pages and 165 illustrations outlining procedures for producing all types of arc welds in mild steel, for welding all metals used to any extent industrially and for applying surfacing metal to meet wear-action in service. Included are recommended current ranges and arc voltages, suggestions regarding arc length, polarity of welding current, distance to hold electrode from work, cleaning beads, welding up or down, use of wide and narrow beads, peening to increase hardness, quenching, and weaving the electrode. Properties of welds produced in various metals are given, and typical welding applications are illustrated.


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Made of strong kraft paper, tightly sealed to eliminate leaks. Top end folds over with easy twist and holds contents securely. Most economical for sending and filing of sand samples. Phone, write or wire for our low prices.

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NO-SMOKE
**STANDCO BRAKE LINING**
Stands the gaff and gets the job done without scoring brake rims. See page 2100 Composite Catalog.
**Standco Brake Lining Co.**
HOUSTON

# NOTES FOR THE Equipment Buyer and User

### International Cementers Takes Over Pacific Cementing Company

International Cementers, Inc., has purchased the physical assets of Pacific Cementing Company, as of November 1, 1940, and will continue to operate in California under the same management and with the same personnel as a nucleus for expanding operations both in the United States and foreign countries.

International Cementers, Inc., has also taken over acidizing operations of Dowell Incorporated, in California, which will be combined with the acidizing units formerly owned and operated by Pacific Cementing Company.

The vice president and general manager of International Cementers, Inc., R. M. Cook, has assumed management of the new company, and R. Henquet, executive vice president, will maintain his headquarters in the Los Angeles office of the company.

International Cementers, Inc., a Delaware Corporation, was formed by Baker Oil Tools, Inc., Byron Jackson Company, Dowell Incorporated and Schlumberger Well Surveying Corporation, and is to have its corporate headquarters at Houston, Texas.

Directors of the company are A. P. Beutel, N. R. Crawford and C. Penhaligen, of Dowell Incorporated; E. G. Leonardon, P. Charrin and Henquet, of Schlumberger Well Surveying Corporation; Frank Champion, of Byron Jackson Company, and T. Sutter, of Baker Oil Tools, Inc.

Officers are: Leonardon, president; Henquet, executive vice president; Cook, vice president and general manager; Crawford, vice president; Beutel, treasurer; Charrin, secretary and assistant treasurer, and C. E. Whitney, auditor.

### Dow Chemical Company Holds Sales Conference

Two hundred representatives of Dow Chemical Company from Canada, Mexico and many parts of the United States attended a four-day sales conference at the company's general offices in Midland, Michigan, last week.

Special cars from New York, Chicago, St. Louis and the West Coast brought guests to Detroit, where a special train transported the party to Midland. All meetings will be in charge of Leland I. Doan, vice president and general sales manager.

Representatives and officers who discussed operations and product developments included Dr. Willard H. Dow, president and general manager; Earl W. Bennett, vice president, secretary and treasurer; R. L. Curtis, general manager, and I. F. Smith, sales manager of the company's Great Western Division, Pittsburg, California; Dr. D. T. Prendergast, Iodine and Insecticide Division, Long Beach, California; Dr. Jose Polak, of Dowell Sociedad Anonima, Mexico City, Mexico; N. R. Crawford, vice president and general manager of Dowell Incorporated, Tulsa, Oklahoma; L. C. Stewart, technical research department, Midland, and M. E. Putnam, president, Cliffs Dow Chemical Company, Marquette, Michigan.

Climaxing the four-day program was a trip by special train to Ann Arbor for the University of Michigan-Northwestern University football game.

### Fire Fighting

C-O-Two Fire Equipment Company, Newark, New Jersey, has issued an 8-page booklet, "In Case of Fire," describing uses of carbon dioxide for fire extinguishment. It shows the company's complete line of hand- and wheeled-type extinguishers, hose systems, and recharging equipment.

### Gears

The International Nickel Company, 67 Wall Street, New York, has issued a bulletin on "Modern Trends in Nickel Steel and Cast Iron Materials." The information was first offered in a paper by C. M. Schwitter, of the company's research division, before the semi-annual meeting of the American Gear Manufacturers Association.

### Cable

John A. Roebling's Sons Company, Trenton, New Jersey, has issued a catalog on "Rubber-Covered Wires and Cables—Service Entrance Cables." Illustrate, it describes strandings, insulations and coverings; rubber-insulated building wires; service entrance cables, and thin-wall building wires and cables using both rubber and plastic compounds as the insulating stock.

WINTER COMING
SURFACE CONTROLS can't FREEZE with
OTIS REMOVABLE BOTTOM HOLE REGULATOR ON THE JOB
Cold weather is coming ... protect your wells with an Otis Removable Bottom Hole Regulator. It positively eliminates freezing of surface controls. Costly heaters are no longer needed. Tubing pressures are reduced to safe workable limits. Regardless of the extremity of the well pressure; high or low rates of withdrawal can be made under a low delivery pressure, merely by adjusting the surface choke.
Simple in operation ... well pressure acts against the movable valve seat, which in turn acts against the regulating spring. This upward travel of the valve seat above the stationary valve permits flowing up through the orifice in valve seat. The distance the valve seat rises is controlled by the pressure differential across the valve seat acting up against the mechanical load of the spring. This load is predetermined and governed by the thickness of the adjusting ring.
Otis Service is available in most major oil fields, for immediate installation of regulators. Installation is made under pressure by an ordinary steel measuring line.
The outstanding economy and safety of the Otis Removable Bottom Hole Regulator accounts for its increasing popularity ... over 250 regulators have already been installed, many of which have been in continuous use over a year.
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DALLAS, TEXAS
1. Slips
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3. Adjusting Ring
4. Regulating Spring
5. Movable Valve Seat
6. Valve

## *Illinois Conference*

[*Continued from page 59*]

offered to indicate a lower Devonian age for all of the New Albany black shale of Indiana. Problems of the lower Devonian of Indiana are submitted for solution.

### Second Devonian Session

At the second session of the Devonian symposium, held Friday morning and presided over by Theron Wasson and Charles H. Behre, Jr., the following papers were presented:

**Devonian System in Northern Missouri**
By E. B. Branson
*University of Missouri*

The earliest Devonian sedimentation in northern Missouri was probably of lower middle Devonian, marked by a sandstone reaching 20 feet in thickness. Above this is the Mineola limestone, of Onondaga age. Resting unconformably above is the Ashland limestone, of late middle Devonian age, with its Newberria fauna. Most of the Ashland was removed before the encroachment of the Callaway sea of upper Devonian age. The Calaway limestone in northeastern Missouri ranges in thickness from a few inches to some 30 feet. Black shales rest on the Calaway, succeeded in a restricted area by the Louisiana limestone. The Grassy Creek shales are identified as upper Devonian on the basis of conodonts and fish remains. The Louisiana is referred to the Devonian on the basis of conodonts and the lack of all productids except Productella.

**The Devonian System of Iowa**
By M. A. Stainbrook
*Texas Technological College*

The author described the subdivisions, lithology, surface and subsurface distribution and stratigraphic relations of the strata of Iowa commonly regarded as Devonian in age. They are the Wapsipinicon at the base, the Independence shale, Cedar Valley limestone, Shellrock, Lime Creek, and possibly the Sheffield at the top. All beds above the Wapsipinicon are regarded as upper Devonian. The Cedar Valley is most widespread, extending into Minnesota, Illinois, Missouri and Nebraska. It is correlated with the Callaway and Mineola in Missouri and corresponding beds in Illinois (Calhoun County). The Wapsipinicon, less widespread, is thicker and gypsiferous in south and central Iowa.

**Subsurface Stratigraphy of the Devonian in Illinois**
By L. E. Workman
*Illinois Geological Survey*

Subsurface Devonian formations, as described from outcrops in the Rock Island region of northwestern Illinois and the Union County region of southwestern Illinois, are followed into the Illinois basin, and their lithologic characteristics and variations were noted by the author. By a series of isopach maps, the thicknesses and areal extent of each formation was shown. The Illinois formations were also correlated with the Devonian formations of adjacent states.

### Oil & Gas Session

Abstracts of papers presented at the oil & gas session, held Saturday morning and over which Alex U. McCandless and C. C. Carroll were chairmen, follow:

**Some Practical Applications of Geology In Illinois Rotary Drilling**
By L. A. Mylius
*Bell Brothers*

The author presented comparisons, pro and con, between rotary and cable-tool drilling methods, with a brief history of development of rotary drilling in Illinois since the opening of the new play. The dangers involved in rotary drilling were pointed out, with steps that may be taken to safeguard operations. The paper outlined the fundamental and necessary prerequisites for rotary drilling procedure, and the subject of supplementary services, including drill-stem tests, core analyses and electric logging. It presented a picture of conditions peculiar to rotary work in the Mississippi Valley.

**The Gas Injection Project at Loudon**
By W. F. Eiting
*The Carter Oil Company*

The trend of the petroleum industry toward application of sound engineering practice is exemplified by the gas injection project in the Loudon pool of Fayette County, Illinois. It is essentially a program of high-pressure or early-life repressuring designed to procure a substantial increase in ultimate recovery. Now two years old, this project takes in the Weiler, Paint Creek and Bethel sands underlying a continuous block of 4720 acres. Because of the situation, involving development of a complex reservoir system with three separate producing sands, special problems, entirely new, have arisen, requiring special equipment and operating practices. The program has progressed toward the desired end by reason of control of reservoir conditions afforded by orderly development and controlled production rates. Encouraging indications of the wisdom of this program can already be recognized in the producing behavior of the wells in the gas-injection area.

**Oil In International Relations**
By W. H. Voskuil
*Illinois Geological Survey*

The author presented a picture of the world oil-producing districts and consuming markets, the political impediments to the free movement of oil, and some of the international tensions that have arisen as a result of the fortuitous and uneven manner in which oil resources are distributed geographically and politically. In Europe and the Far East the character of oil demand differs from that in the United States and Canada. The use of gasoline for automobiles is a smaller proportion of the total. Military and industrial uses, bunker fuel, motor truck and marine use occupy a more important place among the warring powers. Military needs come first.

In non-military nations, such as Scandinavia and the Netherlands, oil is important for the operation of fishing fleets and merchant-marine vessels. In nations lacking railroad facilities, bus transportation is becoming increasingly important. Oil is a commodity essentially vital to the welfare of almost any nation, whether the emphasis be on industry, transportation, agriculture or national defense. Oil and its products are critical in national economy according to the economic and political characteristics of the nation under consideration.

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THE OIL WEEKLY
MORE MEN IN THE DRILLING-PRODUCING INDUSTRY SUBSCRIBE TO THE OIL WEEKLY THAN TO ANY OTHER OIL PUBLICATION.
. . . .
BE SURE TO ALWAYS RENEW YOUR SUBSCRIPTION PROMPTLY.

# Squeaks from the Bull Wheel

### From "Da-Da" to "D-N"

A five-year-old girl was prone to use swear words, and the mother, after trying in vain to break her of the habit, told the child that the next time she used a bad word she would have to leave home.

Everything went well the first day, but on the second, the little one was overheard swearing at her doll. So her mother packed a toy suitcase and told the little one to take it and go.

The youngster sat on the porch for a while and presently a neighbor woman came. "Is your mother home?"

"Damn if I know. I don't live here any more."

### Slight Exaggeration

"See here, what do you mean going around telling people I'm a first-class idiot?"

"It's a lie. I never said first-class."

### After the Game

Sister—"Oh dear, his nose seems to be broken."

Mother—"Yes, and he's lost a front tooth."

Father—"Yeah, but he didn't drop the ball."

### Invitation

You're just like an icicle.

Well, you know an icicle melts easily enough when you hold it.

### Blubberer

Where did you learn to kiss like that?

From eating spaghetti!

### Geometry

I thought you knew her. She lives in the same square as you.

Perhaps. But she doesn't move in the same circle.

### Welcome Duplicate

I hope we don't get any duplicate wedding presents.

Oh, I don't know. My dad's promised us a check for $5000, and I wouldn't mind getting a duplicate from your father.

### Love Is Like That

Me love had flew
  Her did me dirt
Me never knew
  Her was a flirt...
To those I love
  Let I forbid
Lest they be do'ed
  Like I been did.

### Reason Enough

"Just tell me one good reason why you can't buy a new car now," said the persistent automobile salesman.

"I'm still paying installments on the car I swapped for the car I traded in as part payment on the car I own now."

### Late Date

What time is it?

Just one o'clock.

Dear me, how that clock stutters.

### A Last Resort

The Irishman was relating his adventures in the jungle.

"Ammunition, food and whiskey had run out," he said, "and we were parched with thirst."

"But wasn't there any water?"

"Sure; but it was no time to be thinking of cleanliness."

### Love's Labor Lost

A girl met an old flame who had turned her down, and decided to high-hat him.

"Sorry," she murmured when the hostess introduced him to her, "I didn't get your name."

"I know you didn't," replied the ex boy friend, "but you certainly tried hard enough."

### Drawing Lesson

Now, children, I want you all to draw a ring.

All the children did so except Tommy, who drew a square.

Tommy, I told you to draw a ring, and you have drawn a square. Why?

Well, mine's a boxing ring.

### His Very Own

Did anyone ever tell you how wonderful you are?

No, I don't think anyone ever did.

Then I'd like to know how and when you got the idea.

### Success

Was it a big wedding?

I'll say. I got in line twice to kiss the bride and nobody noticed it.

### High Finance

A wildcat operator who was always talking in terms of thousands of dollars, was greeted one evening by his 11-year-old son who announced:

"Well, Dad, I've sold our dog."

"Yes, for how much?"

"Ten thousand dollars."

"Ten thousand dollars! Let's see the money!"

"I didn't get the money. I got two five thousand dollar cats for it."

—Rig and Reel.

### Reasonable Enough

"And let me tell you another thing. You owe your wonderful recovery entirely to your wife."

"Glad to hear it, Doctor. I'll just make the check payable to her."

### One of Them

"I want to buy a cake of soap."

"What kind?"

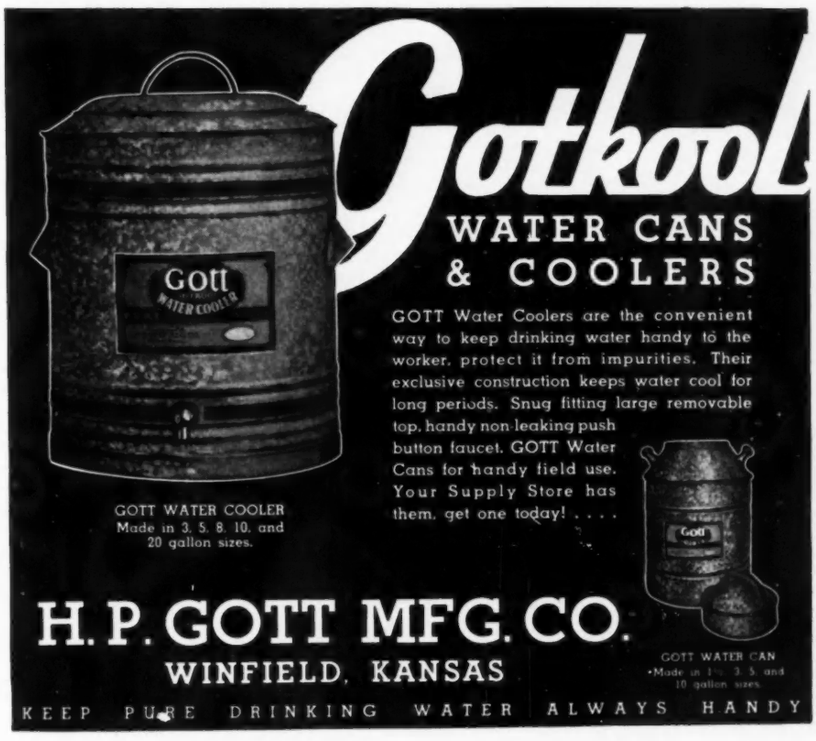
"I don't remember the name, but it's the one the advertisements speak of so highly."

### Relativity

An elephant set out to win the position of "strongest and largest" in the field. He swaggered through the forest and came to a lion. The elephant uprooted a tree with his trunk and hurled it at the lion; the elephant glowered at the lion and said, "Why aren't you big and strong as I am?" The lion replied that he did not know. With a blast of disgust, the elephant turned and trotted away.

Then he came to a leopard. He repeated his tree-pulling act, asked the same question, and received the same reply, and away he went on his mission.

At last he saw a mouse. It was hardly worth a show, so the elephant asked the mouse why he wasn't big and strong. The mouse blinked and replied, "Who, me? Why, I've been sick."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GOTT WATER CAN
KEEP PURE DRINKING WATER ALWAYS HANDY

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The Texas Co. — —
Texas Electric Steel Casting Co. — —
The Thermoid Co. — —
Thompson Tool Co. — —
*Thornhill-Craver Co. — —
*The Timken Roller Bearing Co. — —
Edgar Tobin Aerial Surveys — —
*Tretolite Co. — 33
Trinity Portland Cement Co. — —
Tulsa Shock Absorber Co. — —
*Twin Disc Clutch Co. — —

U

*Union Wire Rope Corp. — —
*Union Carbide & Carbon Corp. — —
*Unit Rig and Equipment Co. — —
*United States Rubber Co. — —
United States Steel Corp. — —
*Universal Atlas Cement Co. — 35

W

P. A. Ward & Co. — —
Warner & Swasey Co. — 10
*Waukesha Motor Co. — —
*Well Machinery & Supply Co. — —
Well Surveys, Inc. — —
Western Electric Co. — 69
*Westinghouse Electric & Manufacturing Co. — —
Wheeling Machine Products Co. — —
*The Wheland Co. — —
Wichita Engineering Co. — —
*Wickwire Spencer Steel Co. — —
*J. H. Williams & Co. — —
*Wilson Manufacturing Co. — —
*Wilson Supply Co. — 44-45
Witte Engine Works — —
*Worthington Pump & Machinery Corp. — 53
Wyatt Metal & Boiler Works — —

Y

Youngstown Sheet & Tube Co. — —